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Smithsonian

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How To Rescue Old Airplanes  
for Fun and Profit

Page 26

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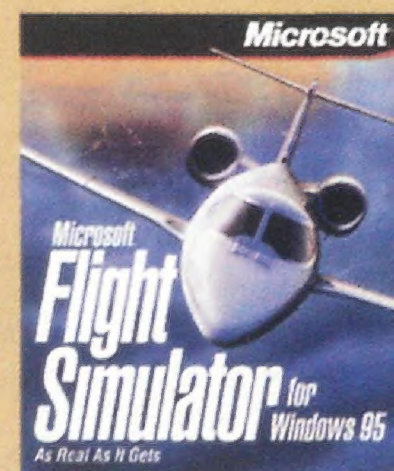
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Smithsonian

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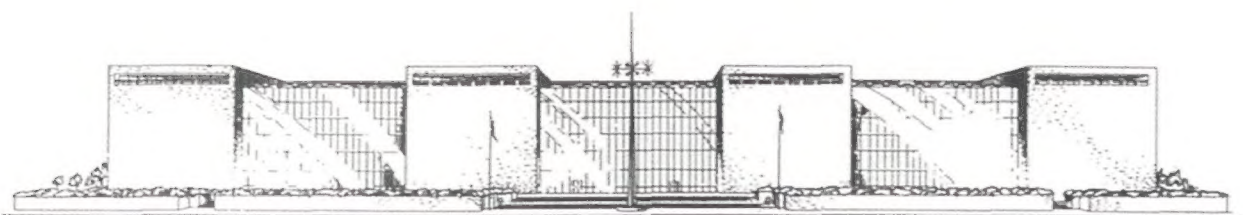
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## Five-Year Plan

**M**ore than 40 years ago Paul Garber secured some unused swamp land in Silver Hill, Maryland, and in his inimitable style talked the Army Corps of Engineers into draining the swamp. Over time, Paul also persuaded Navy Seabees and Army engineers to conduct a series of "training exercises" and put up a succession of storage buildings to hold the growing number of National Air and Space Museum treasures on the site. For the most part, the typical building at Silver Hill was just four walls, a large door, and a roof to keep the rain off the priceless Nieuports, Gaulejets, and others.

Paul and everyone else recognized at the time that this storage facility was inadequate, but it did provide space for our artisans to restore the many craft that are displayed at the National Air and Space Museum. In appreciation, the facility was named the Paul E. Garber Facility. Today, 80 percent of the Museum's treasures are housed there, still hidden from public view. Our docents provide daily tours to small groups, and while these provide opportunities to glimpse at the past, we all agree that we need to find a better home to preserve these important artifacts.

Over the past 15 years many people have dedicated their efforts to creating an improved facility that would do justice to this singular collection of air and space artifacts. Ten years ago, when I was head of the Federal Aviation Administration, I set aside land at Dulles International Airport to be used for this needed Smithsonian facility. Little did I realize that I would end up with the responsibility to create it! But more important than my efforts were those of many dedicated people who labored long and hard, and it was they who kept the project alive through periods of adversity.

On October 1, 1996, President Clinton signed a bill that authorized the Museum to construct a Dulles Center at the Dulles International Airport ("IAD" to you pilots). The bill made clear that the center will be constructed with private funding. Congress previously made money

available to design the Dulles Center, and that process has begun. Now we must raise the money needed to build it, and our goal is to have it completed by December 31, 2001.

This project would not be possible without strong financial support from the Commonwealth of Virginia, which will build the needed access roads and taxiways. The bipartisan state support has been quite heartwarming, and it reflects good county and local business support as well.

The 700,000-square-foot building will be located on airport land about 3,000 feet southwest of the approach end of runway 01R. There's a connecting taxiway to handle the aircraft arriving to go on exhibit and also for visitors who wish to fly in. For those who want to drive, the entry to a 2,000-car parking area, all still to be built, will be near the intersection of Highway 28 and U.S. Route 50, just a 40- to 50-minute drive from our museum on the Mall.

The great hall of the new Dulles Center will enable us to restore air and space artifacts while simultaneously hosting visitors. The main exhibition room will comprise 218,000 square feet, with an arched roof 130 feet high. There will be long elevated walkways (with access for the disabled) from which visitors can view the collection both at eye level and from above. The space shuttle *Enterprise*, the *Enola Gay*, a Constellation, a B-17, an SR-71, a Concorde, and other air- and spacecraft will be on display.

Out of sight but adjacent to the main hall will be large storage areas that will be climate controlled and accessible. Other work and education areas, small exhibit areas, restaurants, gift shops, and an IMAX theater will be nearby.

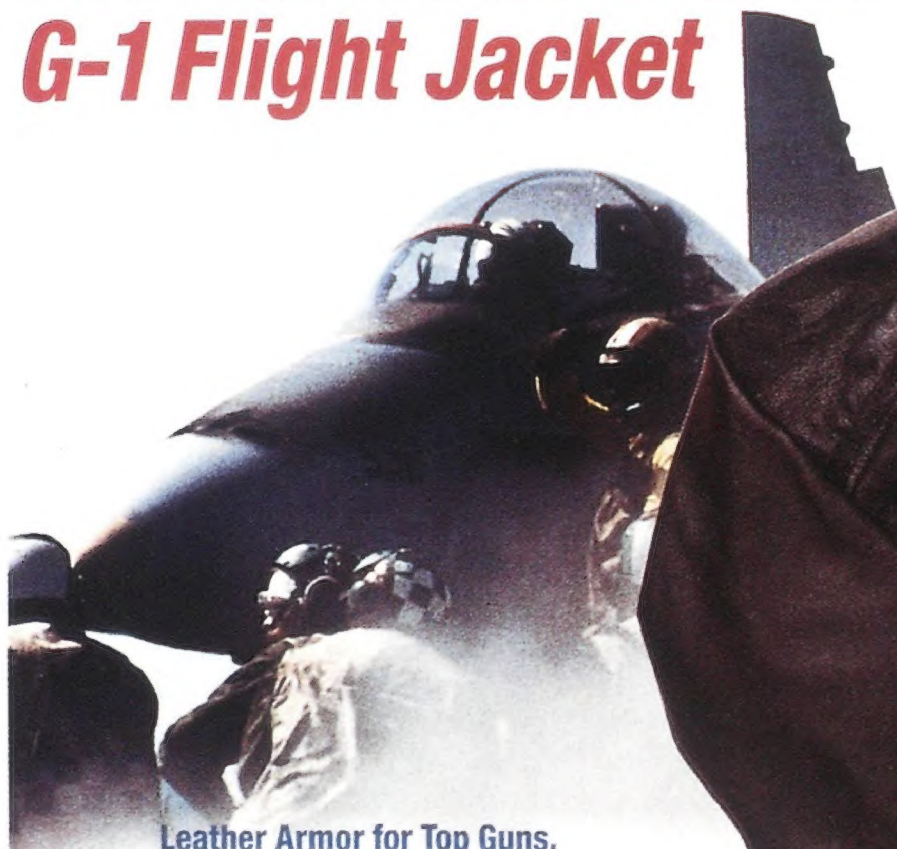
Our challenge now is to raise more than \$130 million to bring our dreams to realization. This will be my primary responsibility in the years ahead, and I am confident we can accomplish that goal.

—Don Engen is the director of the National Air and Space Museum.



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### The Colonel and I

In "A Fresh Start" (Viewpoint, Dec. 1996/Jan. 1997), Admiral Don Engen mentions his near-contact with Roscoe Turner's foot. That reminded me of an encounter I had with the colonel many years ago.

In the late 1930s, Turner was doing some barnstorming at Wier Cook Airport in Indianapolis, where I grew up. I had saved up enough to go there for a ride. My father drove me to the airport, and I got in the line with a couple of dollars in my hot hand. When the loading began for the last flight of the day, I was the last in line. The plane, a low-wing tri-motor aircraft, could carry 14 passengers. I was number 15.

Turner must have seen my downcast look. He came over and said: "Come on. Room for one more." He led me into the plane and marched me up the aisle past all the other passengers, straight to the cockpit, and sat me down in the right-hand seat. I was blown away! I was going to fly copilot with Roscoe Turner!

We taxied out and took off. It was the most memorable airplane ride of my life.

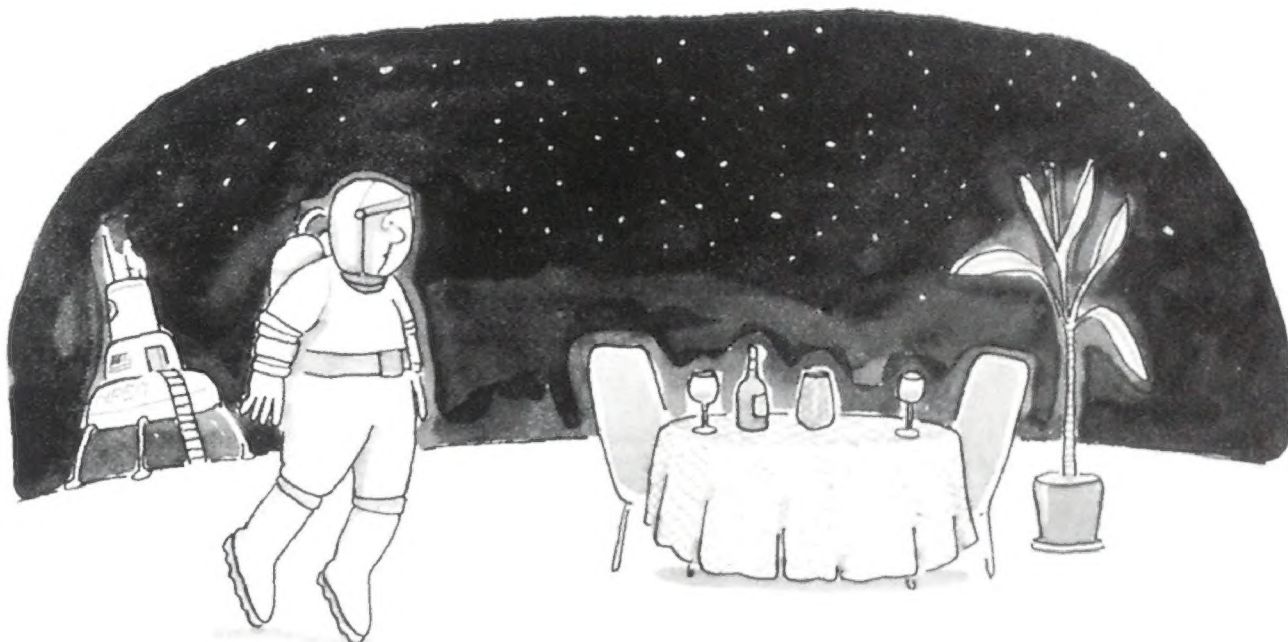
During the 1960s, I was producing an annual motion picture of the Indianapolis 500. One day I spotted Colonel Turner sitting on the pit wall, his waxed moustache being the giveaway. I walked over and recounted my childhood adventure. He absolutely beamed. He proceeded to take me by the arm and walk all over the pit area, grabbing his old buddies and having me repeat the story to each one.

I saw him just about every summer at the speedway, and he never failed to ask me to tell the story to someone new. What a colorful character he was.

—Bill Sprague  
Jamestown, Rhode Island

### A Close Shave

When Pepsico pretended to offer a Harrier jump-jet for seven million points ("Pepsi's Air War," Flights & Fancy, Dec. 1996/Jan. 1997), the company should



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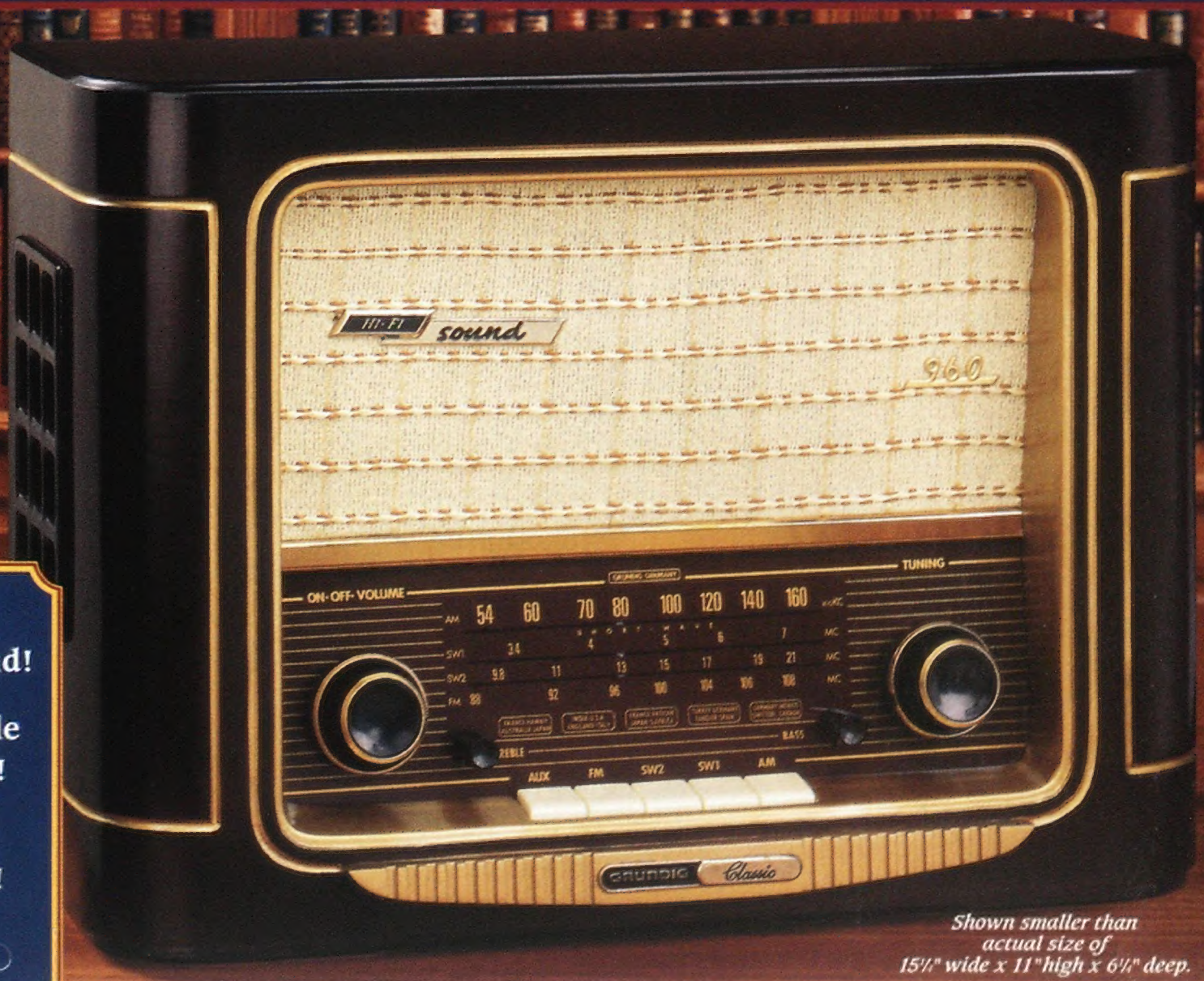
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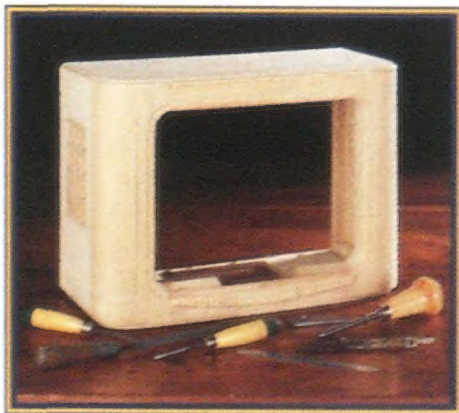
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have realized that someone would have tried for it. Some 50 years ago, the Burma-Vite shaving cream company found itself in a similar predicament. According to Frank Rowsome Jr.'s *The Verse by the Side of the Road*, the company, famous for its multi-part roadside jingles, had planted one series of signs that read:

FREE FREE  
A TRIP TO MARS  
SEND IN 900  
EMPTY JARS  
*Burma Shave*

Burma-Vite assumed that everyone would just chuckle and keep driving, but a Midwestern grocer named Frenchy Gibbs took up the challenge and swiftly began accumulating the needed jars.

Burma-Vite wasn't as mean-spirited as Pepsico; it felt it had to honor the deal somehow. So after studying a world atlas, the company sent Gibbs and his wife on a two-week vacation to Moers, Germany.

—Thomas Bohn  
Vancouver, British Columbia

### Making a Mach-ery of Yeager

In "Deliverance" (Dec. 1996/Jan. 1997), T.A. Heppenheimer reports that an Applied Physics Laboratory team launched an experiment that achieved 1,400 mph in June 1945. Even with wartime security, I would think that this accomplishment would have diminished the importance of Chuck Yeager's X-1 flight (and eliminated the popularly reported fear that the "sound barrier" was impermeable).

—Alan S. Merenbloom  
Baltimore, Maryland

*T.A. Heppenheimer replies: Several bodies had been accelerated beyond Mach 1 before Yeager's flight. In 1918 the famous Paris Gun fired cannon shells that reached Mach 3.5. One war later the V-2 rocket routinely reached Mach 5. In this context, the APL experiment's attainment of Mach 1.4 in 1945 seems relatively modest.*

*None of these feats diminishes the significance of Yeager's flight, which was the first to show that a piloted aircraft could remain controllable when accelerated beyond Mach 1.*

### Something Fishy About That Story

I was greatly dismayed by "Burial at Sea" (Dec. 1996/Jan. 1997). Environmentalists everywhere are shouting at me to recycle every aluminum beverage can, yet tons and tons of precious metals are being

dumped in the sea to make artificial homes for fish! Do these people have any idea how much coal is burned and how much electricity is spent to produce that much aluminum? We may as well forget recycling. My family and all our descendants for the next hundred years cannot save enough aluminum cans to make up for one A-6 dumped in the sea.

And where did the project team get the idea that fish prefer aluminum? A Nippon Steel Corp. ad claims that fish prefer steel.

—Thurlow M. Hausman  
Brookfield, Wisconsin

### Stuff You Auto Know

While I am honored to have been mentioned in "Power Struggle" (Dec. 1996/Jan. 1997), I am embarrassed by the implication that I was Dick MacCoon's first and primary assistant. In fact, Dick hired Lee Muir to begin the project, and Lee hired me. I was only one of a dedicated and diverse team.

Also, although I am quoted as referring to "stuff you don't gotta have," I'd like to think that my grammar is better than that.

—Doug Meyer  
Bend, Oregon

### CASE History

"Search and Destroy: The War on Counterfeit Parts" (Oct./Nov. 1996) contained a few inaccurate statements about the Coordinating Agency for Supplier Evaluation. CASE was started in 1964, not 1967, and unfortunately, the airline industry did not participate in its genesis. CASE was started by aerospace and marine manufacturers. The airlines didn't get involved until the early 1980s.

—Richard Mills  
Middletown, Pennsylvania

*Editors' reply: We regret the errors, which were introduced during the editing process.*



### Another Apollo Coverup

One of the picture captions in "Saturn Rising" (Dec. 1996/Jan. 1997) mentions the large surface area of the Saturn V that required painting. Just how much paint was required, and how much did it weigh? And how much fuel was burned just pushing paint into the sky? Please don't misunderstand me: I have been an ardent fan of the space program since childhood. But how did NASA engineers justify the expense of flying all that pigment?

Incidentally, why was the Saturn V's paint scheme black and white? Why not something more colorful? After all, this was the era of Peter Max and psychedelia.

—Tracy Pettit  
Hastings, Nebraska

*Frank Winter, curator of rocketry at the National Air and Space Museum, responds: According to a 1964 document from NASA's Marshall Space Flight Center entitled Painting Pattern—Saturn V Vehicle, the dried paint on the operational vehicle weighed 490 pounds. Considering the millions of gallons of propellant consumed on the entire mission, the amount needed to fly that additional weight would have made only an infinitesimally small difference.*

*The black-and-white pattern presented an excellent tracking device for what were essentially experimental vehicles every time they were launched.*

### Clarifications and Corrections

Dec. 1996/Jan. 1997 "Home Field Advantage" (Soundings): David C. Tipps of Flight Vision created the picture accompanying the story by combining photographs of model aircraft he built with a photograph of the sky.

"Escape From U Taphao": The Douglas A-1 Skyraider's engine, the R-3350, was made by Wright, not Pratt & Whitney.

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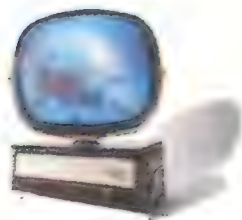


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# I'm Just Wild About Harriet



**I**f the sparse turnout for the Harriet Quimby Research Conference late last October bothered conference director Giacinta Bradley Koontz, it was hard to tell. Koontz—Gia to friends—bounded breathlessly around the auditorium at Long Island's Hofstra University dressed in a turn-of-the-century getup, waving a microphone and behaving like a woman on a mission, which she is: She wants to make Harriet Quimby a household name.

In 1911, Quimby, a pre-feminist, pre-suffragette journalist, became America's first licensed female pilot (on Long Island, thus the location of this year's conference). She went on to become the first woman to fly the English Channel solo, and, less auspiciously, the first U.S. female pilot to die in an airplane crash. Yet most of the rest of her life remains veiled. Where and how did she live before moving to New York in 1903? Where did she receive her formal education, if any? Whom did she love? What color were her eyes?



"Silly little things, really," says Koontz, a screenwriter who became infatuated with Quimby after seeing her picture on a book jacket. "But I want to find the details that help make her a person, not a factoid."

And so for the second year Koontz assembled anyone interested for a day of papers, speakers, and just plain Harriet Quimby-based fun. This year she even cajoled New York City mayor Rudy Giuliani into declaring October 19 Harriet Quimby Day. Despite an autumn deluge that kept the audience down to 33 people, Koontz devoted much of her considerable energy to making the conference as entertaining as possible to the few, the proud, and the drenched. Though no one managed to answer those pressing questions about Quimby, historian Doris Rich offered convincing evidence that she was family-oriented, and Koontz speculated that she may have dared to smoke, and could well have chipped her front teeth hand-cranking her automobile.

"I want to tell every young girl that back in 1911, before there was radio or television, this woman was doing the unexpected," Koontz declared. "She was brave, intelligent, a doer, yet she was born poor on a farm. And I'd really like to find

out what motivated her."

With so much left unanswered, look for the third Harriet Quimby conference at the same time next year. It will be held somewhere in Michigan, where Quimby was born. Koontz promises it will be even bigger—weather permitting.

—Phil Scott

## UPDATE

### Pieces of a Dream

In the ongoing restoration of the Hughes Flying Boat at Evergreen Airventure Museum in Oregon ("Special Delivery," Feb./Mar. 1993), workers have had to repair and recover the rudder and elevator. The museum is selling pieces of the original fabric (some 1,750 square feet) accompanied by certificates of authenticity, for \$26.50. Proceeds benefit the museum's educational fund. Write to the Evergreen Airventure, 3850 Three Mile Lane, McMinnville, OR 97128.



# Out of Season

Aircraft accident reports usually make for pretty gruesome reading, but once in a while they have their lighter side. A terse summary in the July/August 1996 issue of *Flight Safety Digest* required a few phone calls to get the details of a bizarre incident.

Pat Stack, a pilot for the Weyerhaeuser lumber company, was surfing across the green conifer sea of southwestern Washington in September 1995, the skids of his Bell LongRanger just a hiccup above the treetops. You have to stay low and slow on survey flights so the foresters aboard can get a clear view of any plant disease or uninvited vegetation among the young Douglas firs.

Moseying across the lumber company's vast forest near Mount St. Helens that morning, the men spotted elk and deer and a number of humans stalking them. As a good-neighbor policy, the company permits local residents to hunt and fish on its land. Approaching a section of young trees, Stack spotted a parked camper, pickup, and four-wheeler and three people, one in camouflage.

Just as Stack passed over the hunting camp and began a 90-degree turn, he heard a loud BLAM and felt a jolt in the flight controls and rudder pedals. One of the foresters shouted, "God, he shot at us! We're hit!" The forester had noticed the bow hunter tracking the helicopter, and then watched, horrified, as an arrow rose.

Stack scanned his instruments—no red lights—pulled off the power, pushed the nose down, and zoomed down behind a ridge. "I wanted out of there bad," he recalls. Less than two minutes later he put down at a company work yard.

Nobody was injured, but the LongRanger had been roughed up. The broadhead arrow had pierced and bent a rotor blade and then torn the tail fin and boom as its aluminum shaft was chopped by the spinning blade.

Stack says that when sheriff's deputies paid a visit to the hunting camp, the archer complained that helicopters were spooking the game and added, "I'd like to shoot them all down." His safari ended right then and there. He was arrested and charged with first-degree assault. Later, during plea bargaining, the hunter said he had actually shot at a deer but the arrow had somehow been deflected and struck the helicopter, 100 feet away.



DAVID CLARK

the hunter had complied with all appropriate game hunting laws, a lucky thing "because the judges around here go hard on anyone hunting out of season." He paused for a moment, then added, "Of course, he was out of season for helicopter hunting."

—William Garvey

# Space Billiards

Visionaries from NASA and two research laboratories think they've found an affordable way to clean up space: Shoot down space junk with laser guns. The researchers postulate that zapping orbital litter with beams from a low-powered ground-based laser could eliminate the deadliest debris up to 500 miles in altitude within three years for \$80 million.

The laser, dubbed Orion, would target objects ranging from a half-inch to four inches, firing hundreds of pulses at a single piece of junk. Some 150,000 objects in Earth orbit meet the size criteria outlined in the study, which was funded by the U.S. Air Force Space Command and managed by astrophysicist Jonathan Campbell of NASA's Marshall Space Flight Center in Huntsville, Alabama. Researchers include representatives of the Air Force's Phillips Laboratory and MIT's Lincoln Laboratories.

The 50-year-old hunter, an employee of another lumber company, pleaded guilty to three counts of reckless endangerment. He spent 10 days in the Cowlitz County jail, performed 100 hours of community service, and had to write Weyerhaeuser a check for \$27,017.15 for repairs to the LongRanger.

After 13,000 generally placid flight hours, Stack was shaken by the experience. When fired by a compound bow, a metal arrow can drive straight through a deer; the shell of a LongRanger might as well be aluminum foil.

A policeman involved in the case said



CHAD SLATTERY

*In an unusual twist to an old ceremony, VisionAire and Scaled Composites introduced the single-engine Vantage fanjet at a roll-in last November in a hangar at California's Mojave airport. Roll-in host Burt Rutan broke from his tail-first signature style to deliver a relatively conventional planform. Well, not completely: the wings sweep forward, the fuselage, made of composite materials, is virtually free of fasteners, and the cabin cross-section resembles a teardrop rather than a cylinder. Vantage hopes to sell the six-place single-engine jet, for which it has 52 orders, as a cheaper alternative to the Cessna Citation. The aircraft made its first flight a week after the ceremony.*



The debris, concentrated between 125 and 930 miles in altitude, comprises everything from metal screws to rocket shrapnel. The total number of objects includes 50,000 blobs of metal coolant that have leaked from a Russian satellite with a damaged nuclear reactor. All of them are whizzing around at breakneck speeds, threatening satellites and piloted spacecraft in low Earth orbit. "Say you're riding the tourist shuttle someday," says Campbell. "Do you really want to go up in a cloud of 150,000 BBs moving at 20,000 miles per hour? Roll your dice."

The Air Force's Space Command tracks and provides avoidance warnings for large objects. "Anything below one or two centimeters, we can shield against," says Campbell. "Anything above 10 centimeters, we can pretty well detect and maneuver around." But there's no technology available at a reasonable cost

to shield against debris larger than two centimeters (three-quarters of an inch).

Here's how the technology works, in theory: Imagine a pulse of laser energy striking the surface of a marble. The light is so intense that it vaporizes the marble's thin outer shell. "It comes off in a little gas cloud that acts like a little thruster,"

Campbell says. The ablation force propels the marble to a higher altitude but at the same time lowers its orbital perigee. When the marble dips below 125 miles, the atmosphere drags it down and burns it. "Depending on whether it's a Styrofoam or an aluminum marble," Campbell says, "it will reenter in anywhere from a few hours to a few days."

The object won't be obliterated in a single blast. Typically, it will be hit a thousand times in 10 minutes. More massive objects will require longer engagements.

Researchers note that Orion would make a poor anti-satellite weapon. The power levels needed to operate it—five to 25 kilowatts—are so low that burning a

hole in a satellite would take years.

The idea works on paper; the next step is to try it in space. Researchers next want to toss a piece of "simulated debris"—actually a softball-sized satellite packed with tiny instruments—out of a shuttle and bombard it with laser beams.

—Beth Dickey

## G Whiz

Zero G isn't just for astronauts any more. It's also for thrill seekers with \$10,000 to spend on the ultimate ride. This spring, Casey Aerospace will begin construction on a \$50 million attraction in Florida where tourists can board an airliner that flies mile-high arcs and duplicates, for seconds at a time, the weightlessness astronauts experience. "You'll become part of a relatively small group of people who even for just a short time have understood what it's like to break the bounds of gravity," says Ed Gibson, a Skylab astronaut and president of the fledgling Orlando company, which is the




New Yorkers are inured to traffic jams caused by everything from presidents to broken water mains, but here's a new one: Late last November a mockup of British Airways' Concorde kept midtown traffic crawling at a decidedly subsonic pace for nearly three days while workers assembled the 12-ton, half-scale model and hoisted it above Hansen's, a 42nd Street pub. A British Airways spokesman said the model, a three-dimensional billboard, should have been in place within a few

hours of arriving by truck from Texas, but a few loose bolts and structural problems with its mount forced a delay in its perpetual takeoff. Still, the only people miffed at this gate hold were a few hundred taxi drivers. Bleary-eyed workers seemed happy to be collecting overtime, while a Hansen's bartender said, "We've had no complaints." A couple of late-morning customers nodded in agreement.

—Phil Scott





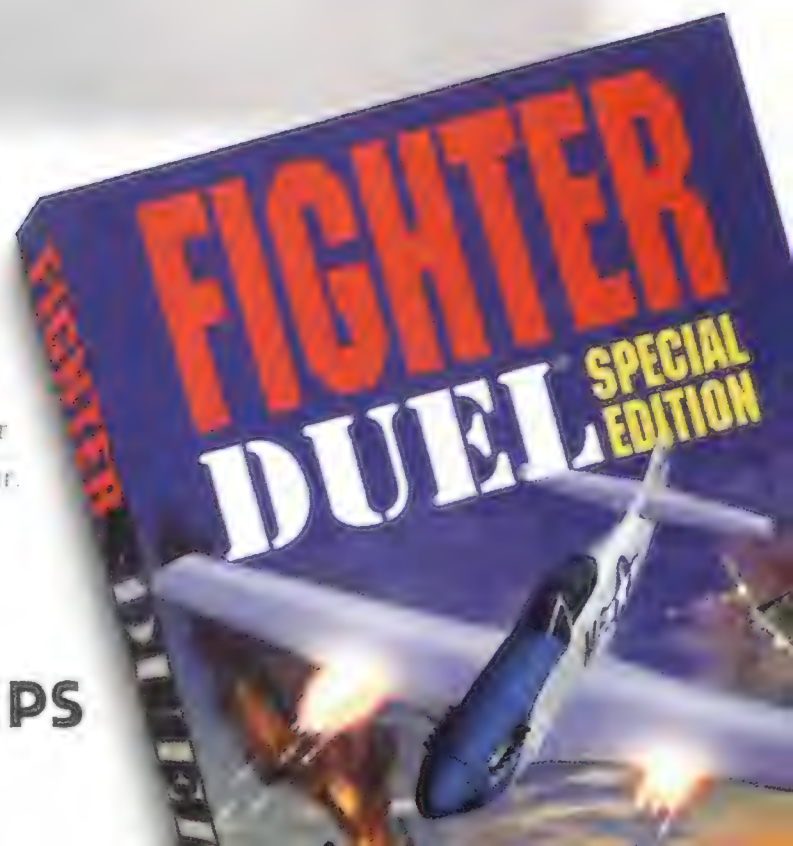
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second to offer zero-G rides (see "Weightless in Wyoming," Soundings, Oct./Nov. 1995). Former astronauts Sally Ride and Norman Thagard are consultants to the project.

Company chairman John Casey, who once worked as a space shuttle engineer and advised the White House on space matters, calls it a "high-intensity roller coaster" and says it will appeal to thousands of people "who have been waiting for just this kind of chance." He anticipates that as many as 10,000 will sign up in the first year.

Ride, a professor at the University of California in San Diego, is developing the center's education program. She plans to include a class on the social and political history of spaceflight, and one tentatively titled "Space for Poets."

Ground school will include lessons in Earth observation, spins in a three-G centrifuge, and coaching on "flying" maneuvers in zero G. In the air, 10 parabolas—totalling about four minutes of freefall—is the limit. Not for nothing is NASA's KC-135 nicknamed the Vomit Comet. "We want people to come away from this with a very pleasant experience," says Gibson.

—Beth Dickey

## UPDATE

### Water, Water, Everywhere?

In an announcement that drew responses similar to those greeting the report that a Mars meteorite may contain tiny fossils, scientists at the Lunar and Planetary Institute in Texas and the Lawrence Livermore Laboratory in California reported last December that the spacecraft Clementine ("Small Wonder," Soundings, Apr./May 1994) may have discovered ice on the moon. Researchers interpreted radar signatures returned by Clementine as indicative of a sort of permafrost, a "small...dirty lake" in a deep crater at the moon's south pole, presumably deposited by comets bombarding the moon for billions of years. Neutron spectrometers aboard NASA's Lunar Prospector, scheduled to be launched in October, can determine the presence of hydrogen and are expected to confirm or negate the theory.

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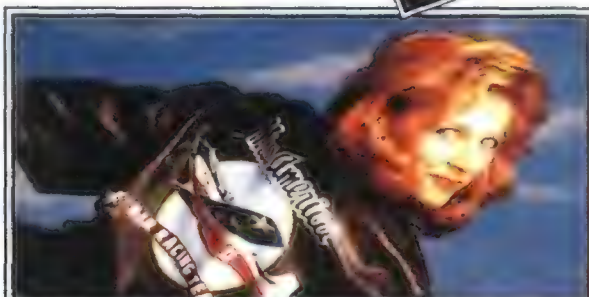


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between city centers or feed traffic to airports for longer flights. At the ceremony announcing the 609, Congressman James Oberstar of Minnesota described this as a way to help meet the continuing demand for growth in a congested air transport system: "Look up and down the crowded east and west coast corridors. There's no possibility to build another airport."

## Full Tilt

Coming soon to a rooftop or patch of pavement near you: an aircraft that flies like an airplane but hovers and lands like a helicopter. Bell Helicopter Textron and Boeing, the partnership that produced the V-22 Osprey military tilt-rotor, will apply Osprey technology to the Bell Boeing 609, the first civil tilt-rotor. The program, announced last November at a ceremony at the National Air and Space Museum, aims for a first flight in July 1999 and first delivery early in 2001.

At less than a third the gross weight of its military cousin, the 609 will carry six to nine passengers. That size will allow the civil tilt-rotor to use existing heliports but operate with a range of 860 miles and a max speed of 316 mph. Company promotional materials point out the aircraft's advantages: A corporate flight department will be able to transport executives faster and at lower seat-mile cost with a tilt-rotor than with its current fleet of fixed-wing aircraft and rotorcraft. The 609's greater reach and higher speed will make it possible to service platforms for oil-drilling rigs that are constructed farther offshore than platforms today. A tilt-rotor will be able to cover far more area in search-and-rescue operations than current equipment. Other markets include emergency medical evacuation and disaster relief, and law enforcement. The 609 will cost \$8 to \$10 million, depending on how it's equipped.

The hope is that a successful 609 will pave the way for larger civil tilt-rotors and encourage development of the new "vertiports" they will require. Tilt-rotor airliners carrying as many as 75 passengers would then be able to fly

Tilt-rotor technology, in development for more than 40 years, wasn't always celebrated as the wave of the future. Under President George Bush, defense secretary Dick Cheney cut military production, branding it expensive and unnecessary. "But he didn't drive a stake through our heart," says Boeing spokesman Nick Kernstock. R&D was allowed to continue, and the program was restored in 1992. "Perhaps someday a tilt-rotor will join us at the National Air and Space Museum," speculated museum director Don Engen, "and it might be up there by the *Spirit of St. Louis*."

—Lester A. Reingold

## UPDATE

### From Commander to Copilot

Astronaut Robert "Hoot" Gibson left NASA last November to join Southwest Airlines in Dallas as a first officer on Boeing 737s ("Max Q Puts the Rock in Rockets," Soundings, Feb./Mar. 1992). Gibson was selected as an astronaut in 1978 and first flew on the shuttle in 1984. He commanded four shuttle missions, most recently the first shuttle-Mir docking in 1995. Of all the career moves he could have made, why did he choose that of a lowly first officer? "All my life, I've never been able to get enough airplanes," Gibson says. "This keeps me flying every day."

## SOME PEOPLE GET UPSET ABOUT TURNING 50, WE GOT A GOLD AWARD

*WEATHERWISE* magazine, soon to celebrate its 50<sup>th</sup> birthday, recently won a Gold Award from the Washington Edpress for the August/September 1996 issue. Several individual articles also received honors. This public recognition confirms what thousands of readers already know: it is a great magazine.



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## The China Lake Launches

**I**n the spring of 1990, a small Virginia-based startup company called Orbital Sciences introduced what it called a new vehicle to the U.S. launch fleet. Dropped from the wing of a B-52 bomber, the Pegasus air-launched rocket seemed a model of cleverness, economy, and fresh thinking. It may have been the first two, but not the last. Three decades earlier, in the summer of 1958, a group of rocket engineers at the China Lake naval weapons laboratory in California tried six times to air-launch tiny satellites into orbit.

Some people insist to this day that they made it.

In the frantic summer after Sputnik, the Navy was still smarting from the embarrassment of several all-too-public Vanguard rocket failures the previous winter. Although the Army's Explorer 1 and the Naval Research Laboratory's Vanguard 1 finally reached orbit in early 1958, America was still playing catch-up to the Soviet Union.

Engineers at the Naval Ordnance Test Station (NOTS) at China Lake had responded quickly to the Eisenhower administration's urgent request for proposals to launch a satellite—any satellite—into orbit. After an early suggestion to fire a rocket from atop nearby White Mountain (even the sci-fi film idea of launching from a ramp running up a mountain was considered), NOTS decided to build a booster based on the solid-propellant Sergeant missile. That plan died when the Army couldn't supply the required Sergeant motors.

Undaunted, the NOTS technical staff, led by Howard Wilcox, proposed launching the rocket from a jet fighter serving as a recoverable "first stage." The aircraft would lift the vehicle above the dense lower atmosphere, significantly reducing the amount of energy needed to place a payload into orbit. A one-ton airborne rocket could deliver a two-pound satellite to a 1,500-mile-high orbit. Not only was the air-launched concept cheap, it could put a satellite into any orbit, anytime, from anywhere.

Navy brass accepted the proposal in early 1958, partly as a way to hedge their bets in case Vanguard fizzled. The only provisos were that NOTS find the money—which eventually totaled \$4 million—in its existing research budget, and that the whole thing be kept secret. In other words, no more public embarrassments.

Officially, the program was designated

Project Pilot, but station personnel, following the Soviet lead, referred to it as NOTSNIK. The payloads for the first three launch attempts were simple diagnostic instruments; radiation detectors were added later to support the Argus high-altitude nuclear tests conducted as part of the International Geophysical Year. The whole payload measured only eight inches in diameter.



*In the late 1950s, Naval Ordnance Test Station engineers planned a novel method of launching a satellite. The classified NOTSNIK program succeeded in launching rockets from a Douglas F4D Skyray, but the jury is still out on whether the payload reached orbit.*



The five-stage rocket was a classic bullet-shaped configuration with four large fins. Measuring 14 feet long with a span across the fins of five feet, it barely fit under the wing of a carrier-based jet fighter. Modified anti-submarine missiles—called HOTROCs—were paired for the second and third stages (the first stage being the launch aircraft). Stage four was borrowed from Vanguard, and the tiny upper stages (the sixth stage was the payload) were designed and fabricated in the same China Lake shops that produced the Sidewinder missile.

Planning for the aerial launch fell to a Canadian-born NOTS research pilot, Commander William West. A career U.S. Navy officer who had enlisted the day after the attack on Pearl Harbor, West spent weeks practicing the tricky “bomb toss” launch maneuver that would release the satellite from under the left wing of a stripped-down Douglas F4D-1 Skyray fighter.

On July 25, 1958, West took to the air with the first live NOTS rocket. After a phone call to alert the White House of an impending launch attempt, he left China Lake’s airstrip at Inyokern and headed for the Navy test range at Point Mugu, California. Flying south over the Santa Barbara Channel to the drop zone, West nosed the Skyray into a steep climb. The rocket released automatically at 41,000 feet, and three seconds later the first two

HOTROCs erupted in smoke and flame.

No sooner did the rockets ignite, however, than West found himself fighting to keep control of his plane. The sudden release of weight had flipped the Skyray, which began tumbling. In mid-crisis West looked out the window and saw what he thought was the NOTSNIK vehicle exploding.

That’s what he reported, but it wasn’t what happened. According to John Nicolaides, who was then technical director of the Navy’s space program in Washington, what West actually saw was the plume from the rocket staging as it expanded in the thin upper atmosphere. To a preoccupied pilot, it looked for all the world like an explosion.

When the NOTS team at China Lake heard from West that the vehicle had exploded, they ordered the half-dozen or so tracking stations around the world to shut down. Only one station, in Christchurch, New Zealand, heard a beep in the right place at the right time. The signal never repeated, though, and without confirmation, it was hard to claim success.

The second NOTSNIK attempt, in mid-August, ended in a HOTROC motor explosion, but the third try, on August 22, returned another mixed message. The ground lost radio contact during the second-stage burn, but the vehicle was caught on film as it disappeared over the

horizon. At the predicted times for the first and third orbital passes, Christchurch reported possible signals from space.

Was NOTSNIK in orbit?

Once again there was no independent confirmation of the “signals,” nor did tracking cameras see anything from the ground. Flights four through six failed while still in the atmosphere, so the NOTSNIK program ended without ever officially reaching space. Years later, according to China Lake historian Leroy Doig, program manager Wilcox could only say: “I’d like to think they did, but there’s no way to prove it either way.”

Nicolaides, though, tells a different story. Last year he allowed NOTSNIK material that had been under wraps for nearly 40 years to be declassified, and he began talking to the press, notably for an interview in the July 1996 issue of the British magazine *Spaceflight*. Nicolaides says there was “never a doubt in my mind,” nor in the mind of William McLean, then the technical director of NOTS, that the first and third launch attempts reached orbit, based on the pattern of signals returned from the different tracking stations. Nicolaides in fact reported success to the White House at the time. But in the skittish days following Vanguard, there was “no point in claiming an orbit unless you were goddamned sure.” So, he says, the Navy decided to keep quiet.

The Pentagon and White House had another reason for not rushing their story into the newspapers. It wasn’t lost on military officials that a rocket launched from an airplane had potential as an anti-satellite weapon. In fact, follow-on tests of NOTSNIK from 1960 to 1962 (under “Project Caleb” and other names) were conducted with exactly that goal in mind. Why advertise a potentially important new strategic capability?

Around the same time, says Nicolaides, Secretary of Defense Robert McNamara decided to gut the Navy’s space program, and the Air Force never pursued the program with the same enthusiasm, although it did demonstrate an anti-satellite missile launch system based on an F-15 in the mid-1980s. But the air-launch concept wasn’t fully explored until Orbital Sciences announced Pegasus.

Should NOTSNIK have been counted as America’s fourth satellite in orbit? Nicolaides admits: “We didn’t have enough information, and we couldn’t prove it” to the outside world. But, he adds, many of the NOTS engineers who slaved on the project that summer, and who “damn well knew it was in orbit,” were angry that the Navy never even made the claim.

—Joel Powell

U.S. NAVY (2)





# Flight for the Common Man

**A**t the Avon women's softball game, Denny Almendinger sat next to me explaining how he'd screwed up flying his Skye Ryder. "Power lines," he said sheepishly; "you can't forget about them goddang power lines." The week before, a reporter had wanted to photograph him. He flew low along Spotted Dog Road and forgot about the power lines that run up to Kertulla's ranch. "The back wheel kind of bumped over the wires," he explained.

Several times recently I'd seen Denny up in this powered parachute. It's a form of flight too new to have a generic name. The Skye Ryder is a three-wheel go-cart affair with a motor and pusher propeller mounted behind the pilot's head. In flight the whole thing hangs under a rectangular parachute canopy big enough to cover a trailer house. When I had gone to look at it the second time, I loaned Denny my skydiver's wrist altimeter.

A few low clouds hung over the Garnet Range foothills that abut Avon's ballpark. The Avon Ladies were having their way with the Seeley Lake team. The most captivating part of the game was the lousy umpiring.

Denny and I kept up the flying talk. "You're a skydiver, Tom. You could fly it."

I didn't answer. I thought about saying that I had to go home and mow the lawn or start the barbecue or set fence posts.

Denny didn't press me. We watched another inning. We kept looking up and assessing the nascent cumulus puffs that would coalesce into thunder cells by late afternoon. "Pretty sky," Denny said; "should stay good for another couple hours." My heart beat faster. "Yeah."

There it was. There was no sense in putting this off. Since the evening I watched Denny fly above the Little Blackfoot River, turn, and cover the two miles to my place above the valley in a few minutes, I'd known that I wanted to fly this thing.

"You'd really let me take her up?"

"Sure," he said as easily as if he were loaning me a socket wrench. "C'mon, I'll show you how to take off."

We walked to Denny's shop, where he works on his silver Peterbilt log truck, his Timberjack log skidder, and the various dump trucks, pickups, and chainsaws he uses in his logging business. Denny's reputation as a steadfast logger has grown and he makes good money. Nosed up to his new double-wide trailer house is a white Mitsubishi 3000 GT, probably the most exotic car ever seen in Avon, Montana. But that sports car couldn't sate a middle-aged logger's adrenaline

addiction, and sitting in his shop was the bright green Skye Ryder.

It looked about as substantial as a K-Mart chaise lounge. Three spiffy little chrome wheels with wheelbarrow-size tires supported a triangular framework of inch-and-a-quarter tubing. Denny had broken the axles in some bad landings, but he fabricated some beefed-up ones. They were holding, he said. The molded plastic seat had a lap belt. A triangular frame rising behind the seat held the two-cycle motor. Denny grabbed the tubular frame that encircled the four-foot propeller and protected the parachute

ROSEMARY HENRY-MAY





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canopy and shroud lines during takeoff and landing. He rocked the little bird lovingly and said, "Pretty good deal, huh?"

He explained how you fly it. "Pretty simple. You want to go up, you push the throttle forward," he said. "Pull back and you come down." He had me sit in it. A pair of three-foot-long pipes were hinged out from the foot rests. Attached to their ends were red toggle lines exactly like those with which I steer my parachute. "Push with your foot on the side you want to turn to," he said. "You'll know what to do." For taxiing there was a steering stick with a padded grip that turned the nosewheel. "Bend it the way you want to go," Denny said. "It'll pretty much go straight by itself."

He pulled the starter rope that dangled above the seat. The engine coughed and stuttered up to a racket somewhere between a big chainsaw and a small snowmobile. The whole frame shook and surged, and I chocked a wheel with my foot while Denny warmed it up and adjusted the idle. He hollered at me to open the gate to Earl Knight's hay meadow across the highway. As Denny taxied over, Earl rode across the meadow toward us on his old Honda 90 with a shovel bungeed across the handlebars and his little border collie blurring around him. Denny shut the motor off and told me that Earl might be coming to ask him to quit using his meadow now that the grass hay was up six inches.

Earl pattered up, pulled a pack of butts from his bib overalls, and asked if it was okay to smoke, as if this deal could blow up anytime. Denny said he hoped that he wasn't hurting the hay crop. Earl hoped "the water don't mess up—What would you call it?—your landing strip?" Denny said "landing strip" was probably right.

Denny handed me his helmet and pulled the canopy out of its stuff sack, arranging it behind the machine like he was straightening out a table cloth 10 feet wide and 40 feet long. "On your takeoff, start out slow," he said. "Be smooth with the throttle. A little speed and you'll feel the chute fill up. If you remember, look over your shoulder to see if it looks normal. Then just goose it and stay on it and pretty soon you'll be flying. Stay on it at least until you clear the power lines."

Earl, straddling his motorcycle, looked doubtful. "You're going to fly, Harp?" he asked. "Sure, Earl," I said; "those dirt bikes kill more people than these things."

"Maybe so," he replied, "but it's not as far to fall." He coughed politely into his fist for a couple of seconds and said "Bad boy, Bill" as his dog finished peeing on the front tire.

"Like I said, ease back on the throttle and you'll come down," Denny continued. "Hell, Tom, you've landed parachutes more times than I've landed this thing. You'll know what to do."

"How much throttle do you use when you land?" I asked.

"Oh, it's different every time. It's hot today, it'll take a little more."

"How many revs on the tach should I be looking for?"

"You're going to be pretty busy. Don't get hung up looking at the tach," he said. "Just come in low and slow and flare it like a parachute when you're maybe six, eight feet off the ground. If you don't like the looks of things, give 'er the gas and come around for another try."

"Let's do it," I said.

We checked the shroud lines for twists and tangles and I put Denny's bicycle helmet on. Before I strapped myself in I

**There was no sense in putting this off. Since the evening I'd watched Denny fly above the Little Blackfoot River, I'd known that I wanted to fly this thing.**

tossed him my Swiss army knife and told him if anything bad happened he could keep it. He weighed my pocket knife in his hand, surveyed, perhaps for the last time, this \$9,000 machine that he'd built from a kit, and had the heart to say, "Nice knife."

Denny cleared back. Earl kick-started his dirt bike and circled away a few feet. I pulled twice on the starter rope above my head and the two-cycle motor burped maniacally and ranted up to speed. Bill hopped behind Earl with his tail between his legs as the propeller pushed enough air to begin inflating the ram air canopy. As my forward speed increased it felt as though the big chute was holding me back. But as it climbed and arced overhead its profile became a wing in the wind and I gained speed and took off.

It was strange to feel the billowing tug of the canopy transferred through the frame instead of pulling at my crotch and chest. Once I was airborne I swung sideways. My attempts at controlling the canopy seemed like a second-hand experience. It didn't respond like a sport chute does. I realized with mounting misgivings that this was truly a new experience. But with my right hand on the stubby little throttle I could ascend at will.

By the time I got to the power lines I was up 150 feet or so. I started trying to make a left turn out over the couple of dozen homes, two churches, and general store that make up Avon proper. It seemed vaguely intrusive, flying along at no more than a bicyclist's pace, invading what little privacy such a small, tight town affords. I could see sloppy woodpiles, vehicles with their hoods open, and major appliances lying in back yards. Avon looked shoddy and dangerous.

Wondering where I could land if the engine quit, I flew southeast and, still climbing out over the highway, headed for the east end of town, where the softball game was in late innings.

The Little Blackfoot valley narrows dramatically just east of the ball park. I didn't think the Skye Ryder would turn sharply enough to avoid the timbered slopes that form the valley's gap. Denny had mentioned that, according to my altimeter, they are 700 feet high. The altimeter showed me at 500 feet. I didn't know if I had time to climb over them. I pushed on the long pipes to which the steering toggles were fastened, and not feeling the response that I'd expect from a parachute, I released the throttle, grabbed the toggle line above my right shoulder like I would in a parachute, pulled hard, and involuntarily screamed "Shit!" at the alacrity of the canopy's response. It was my most dramatic maneuver so far. I let go of the toggle and pushed the throttle all the way forward to regain the altitude I'd lost. Impressed at how well the little thing climbed, I reached up and pulled sharply on the left steering line, grateful to discover how to get some performance out of the machine.

Later I learned that the softball players, who had become accustomed to Denny's buddha-like silhouette under the translucent canopy, became curious about this pilot cursing and laughing and flailing his arms while circling pendulously above their game.

Feeling more adept at turning, I headed back to the meadow where Earl and Bill and Denny waited like a little clump of cottonwood stumps. I gave them a thumbs-up and looked for ditches that could mess up my landing. As I made another circle out over Denny's shop, I noted the flaccid windsock. I



experimented with the throttle to see how fast I would drop when I cut back on fuel.

On my approach I had only a row of 60-foot cottonwoods to clear at the east end of the meadow. Then I eased back to about a quarter throttle and seemed to drop slowly. Things looked about right. I hoped Denny took comfort from the smoothness of the drop in rpms. But going easy on the throttle was the only thing happening that felt familiar. This is not at all like a parachute, I thought.

I saw Earl and Denny peripherally, from about 20 feet up. I cut back more on the gas, then reached up and pulled hard on both toggle lines to flare the canopy and slow down. The huge chute reacted so slowly that I gave up on a safe landing, released the toggles, and jammed the throttle forward in panic just as the rear wheels touched.

But as I climbed slowly I thought I had it, so I jerked back on the throttle, flared the canopy again, and landed on the rebound. The Skye Ryder lands at the same speed it flies, 26 mph, which seems pretty fast when your butt is about a foot off the ground. The engine fell to a loud idle and the canopy stalled. I shut off the two ignition switches and the prop stopped before the chute fluttered down behind me.

Earl and Bill went back to irrigating and harassing gophers. "Pretty good landing," Denny said. "Never seen that before. It looks good in the air too." I told him the landing was less than graceful. "Don't worry," he beamed, "you'll do better next time." He told me there was a guy in the Helena valley with 200 hours in these things who could probably land on the roof of his trailer. "Whose trailer, yours or his?" I asked. "Well, hell, either one, but his ain't no double-wide," Denny said.

For me, the image of this graceful, accessible form of flight is intertwined with the image of trailer houses. Like hang gliders, paragliders, and ultralights, these machines make flying egalitarian. The pilots may live in trailers, but they can take to the air in a machine cheaper than a used pickup. They don't need licenses, registration, airports, radios, or thousands of dollars' worth of training. The fact that people like me and Denny and some guy living in the Leisure Village trailer court can fly invests our lives with a richness of possibility.

But it was hard to appreciate that richness at the moment because Denny told me that he was getting a little bored with the whole deal. He added that it might be fun to fly places with other

people, like an aerial motorcycle club. "I'd sure like to fly with somebody," Denny said shyly.

When I got back to the softball diamond, the victorious Avon Ladies were taking batting practice and giving some kids a turn at the plate. My son and his pal Brett Wheeling rode up to me. Derry asked quietly, "Was that you in Denny's, uh, flying machine?" Derry and Brett are learning the gravity-defying intoxication of trampolines and I didn't want to devalue any of this by sounding too hearty. "Yeah," I said.

Brett, who can do a full flip with a half twist, said, "You flew it alone?"

"It was glorious."

"Cool," they chorused, and popped mountain bike wheelies over to the schoolhouse swing set that they had outgrown until they discovered the pleasure of swinging high and jumping. Last week Derry asked me: If a guy can do a flip on the trampoline, couldn't he do one off a picnic table? I suppose, I said, but it would be different. I told him he'd have to be way faster than he is on the trampoline. Derry will probably try it soon. And soon, one evening, I'll head down to Denny's to see about my pocket knife.

—Tom Harpole



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## From Russia With MiG

**S**even years ago, Alexander Zuyev was a 27-year-old captain in the Soviet air force. Rising quickly through the ranks, he won an assignment flying the most advanced Soviet fighter of the day, the MiG-29. His position as an officer earned him the respect of his countrymen, a membership in the Communist party, and the attention of beautiful women—one of whom he married. It seemed unthinkable that Zuyev would ever betray the system that allowed him to flourish in a profession he loved. But on May 20, 1989, he walked away from the only life he had ever known.

Last November, Zuyev stood before a rapt audience at the National Air and Space Museum and talked about the daring escape that had brought him here. Speaking with a soft Russian accent, Zuyev occasionally tossed off jokes and grinned in a way that emphasized his boyish good looks. But no amount of humor could detract from the drama of his tale, and at evening's end, Zuyev had delivered one of the most riveting lectures ever heard at the Langley Theater.

Of his decision to defect, Zuyev explained: "It was not an easy decision for me. I wasn't drunk. I wasn't out of my mind. It was a very calculated decision—and well-planned." In the end, it appeared to be the only way out for a man who had grown increasingly uncomfortable with the rampant and deeply embedded corruption of the Communist system. "Perestroika and glasnost opened my eyes," said Zuyev. For a country that had long swept failures and atrocities out of sight, the new glasnost, or openness, initiated by former Soviet premier Mikhail Gorbachev, was starting to expose the often ugly injustices Soviet citizens commonly endured. The

Communist machine had, in fact, committed Zuyev's mother to a rundown psychiatric "clinic," where she was forcibly sedated. Fortunately, Zuyev was able to rescue her, but his faith in the Soviet government had been irreparably shaken.

Then on April 9, 1989, as thousands of pro-independence demonstrators converged in Tbilisi in the Soviet republic of Georgia, Soviet security forces moved in with armored personnel carriers for an ambush. The soldiers slashed at the unarmed Georgians with sharpened shovels and released toxic gas. The massacre, which killed 19 people and seriously wounded 300 more, horrified Zuyev and many of his fellow officers. The attack also left Zuyev wondering how long it would be before Soviet air force pilots were ordered to bomb and strafe their own people. "I was not trained for that," Zuyev told the audience. "I was trained to defend my country. I was not trained to disturb peaceful demonstrators.

"In Russia we say, 'That was the last drop in the cup that made it overflow,'" he continued, adding: "I had to come up with a plan." Zuyev, who was based at the heavily defended Mikha Tskhakaya air base in southern Georgia, decided to seize one of his regiment's MiG-29s, then fly low and fast into nearby Turkey.

Once he'd made the decision to escape, Zuyev scheduled a visit to his hometown, Samara, to visit his mother and younger brother (his father had died earlier). He told his family nothing of his plans, which would make the inevitable KGB investigation somewhat easier for them. Zuyev and his wife Jana had already parted company.

As Zuyev started plotting the details, he realized he needed to buy several items, many of which he could get at a bazaar in town. The list included a pair of strong wire cutters, a thin metal file, butter, sugar, eggs, and 18 bottles of tranquilizers, which he rounded up at four different pharmacies.

KATSUHIKO TOKUNAGA/CHECK SIX (COMPOSITE)





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AVIATION  
WEEK & SPACE  
TECHNOLOGY



Zuyev decided to make his break for freedom at dawn on May 19—40 days after the massacre in Tbilisi. On the morning of May 17, he baked an enormous cake—a seven-pound, three-layer beauty covered with tranquilizer-laced frosting and garnished with fresh strawberries. Bad weather forced Zuyev to delay his escape by a day, but on the night of May 19, he carried the confection over to the base's duty-alert building. The men—two pilots, three maintenance officers, and 12 alert-guard soldiers—cheered when they saw the cake, and later they retired to the dormitory and fell into a drugged sleep. Zuyev stayed awake and went about his rounds: cutting telephone wires, jamming a lock, and checking on the crew. At dawn he was ready to seize the MiG.

As the sun rose above the Caucasus mountains, Zuyev walked quickly to the end of the base's apron, where four MiG-29s sat sheathed in canvas. But before Zuyev could climb into one, he had to subdue and tie up the apron guard, who was armed with an assault rifle. In the ensuing scuffle, the guard started firing his rifle, and one of the bullets entered Zuyev's upper right arm. Zuyev returned fire with his Makarov 9-mm pistol, striking the guard (he survived). Zuyev, now starting to panic, ran to one of the fighters. "I only opened the inlets for the engines and pulled the chocks out of the wheels," he said. He jumped in, got both engines running, then taxied hastily toward the runway. After lining the nose up with the centerline, he shot down the runway on afterburner. Sweeping past the control tower, he rocked his wings back and forth as a farewell to his friends.

To avoid radar detection, Zuyev, flying just under Mach 1, kept to an altitude of only 100 feet. By now, the bullet wound had numbed his right hand, forcing him to rely on his left to move the controls. "I have to tell you it was not precision flying," admitted Zuyev. "Not like Blue Angels."

Zuyev popped up to 300 feet to clear a set of power lines, and the next thing he knew he was flying over the dark water of the Black Sea, headed southwest for Turkey, 100 miles away. Zuyev's gain in altitude, however, was followed by the blinking of his radar-warning lights: The MiG was being swept by the radar on a missile system at a nearby Soviet air defense base. Zuyev immediately dispensed packets of aluminum chaff, which would create a big cloud on the

base's radar screens, concealing the MiG's descent back down to 100 feet.

A few minutes later, the warning lights flashed again. This time Zuyev was being swept with radar from an airborne source: another Soviet fighter dispatched to shoot him down. Zuyev saw nothing in his cockpit mirrors. Once more he pumped out chaff and dove even lower, successfully avoiding the radar lock-on of an Alamo air-to-air missile.

Soon after, Zuyev started feeling sick and dizzy, but he persevered and was rewarded with the sight of the Turkish coast. He quickly located the airport of Trabzon, and seeing no other traffic, made his approach. He landed at 5:40 a.m. and waited for someone to arrive. When no one did, he restarted his engines and taxied to the terminal. An old man stared wide-eyed at the missile-equipped MiG through a glass door. Zuyev smiled and beckoned to him. When the man came over, Zuyev shouted in English: "I am American!" The old man smiled and helped him out.

Under tight security, Zuyev spent

several weeks recovering in a hospital, and during that time, the Soviets pressed the Turks to extradite him back to Georgia. The Turks refused. They did, however, agree to return the hijacked MiG-29, much to the dismay of Zuyev, who had hoped to turn it over to the United States.

On the morning of June 17, Zuyev was put into an armored van and escorted by officials from the Turkish Defense Ministry to a deserted country road

outside of Ankara. There he met with a delegation from the American embassy, which arrived in two security vans and a limousine. The U.S. ambassador motioned for Zuyev to climb into the back seat of the limo. Then he announced: "Alexander Zuyev, the United States of America grants you political asylum. Welcome to America."

"That was a very special moment for me," recalled Zuyev. "I was on my way. How I got here I cannot tell you—then I'd have to kill you." The audience roared with laughter. "That was a joke," he said with a grin.

Once he reached the United States, Zuyev lived for a time in a safe house. Two years later, he brought his mother and brother over. He also started working on a book, *Fulcrum: A Top Gun Pilot's Escape from the Soviet Empire* (Warner Books, 1992), and later remarried. During this time, Zuyev was briefing U.S. military strategists on the state of Soviet military technology and training methods. One of the U.S. F-15C units that Zuyev worked

with during the Gulf war destroyed five MiG-29s and at least 10 MiG-23s and Sukhoi attack aircraft flown by Soviet-trained Iraqi pilots.

Zuyev told the audience that he befriended many of the American military pilots with whom he worked, but not before dispelling their notions of Soviet pilots as rigid, limited, and lacking in initiative. "Totally wrong," said Zuyev. "It was totally wrong. Both sides were trained well, loyal, dedicated, and could die for the country or cause."

"The best thing happened to us," he said softly. "We never went to war against each other. Nobody would win that war."

—Diane Tedeschi

## Museum Calendar

Except where noted, no tickets or reservations are required. To find out more, call Smithsonian Information at (202) 357-2700, Mon.–Sat., 9 a.m.–4 p.m.; TTY (202) 357-1729.

**February 12** "Why Look From Space?" Nicholas Short, author of *Landsat Tutorial Workbook*, discusses the use of satellites to gather information about planetary surfaces and atmospheres. Langley Theater, 7:30 p.m.

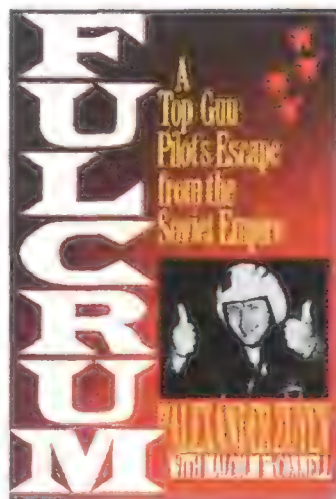
**February 20** "Air Force Special Operations." Brigadier General Howard J. Ingersoll will talk about the future of the Air Force Special Operations Command, which can deliver immediate air combat power in any emergency. Langley Theater, 7:30 p.m.

**February 22** National Air and Space Society Lecture: "Return of the Eagle." Gunther Rall, a top Luftwaffe ace during World War II, talks about his combat experience and his postwar career in the West German Air Force. Tickets are \$15; to purchase them, call (202) 357-3762. Langley Theater, 7:45 p.m.

**March 5** Mary Henderson, curator of the National Air and Space Museum's upcoming exhibition, "Star Wars: The Magic of Myth," will explore how Star Wars creator George Lucas uses the classical hero's journey in his films. Langley Theater, 7:30 p.m.

**March 13** "U.S. Air Force: 50 Years of Service." General Ronald R. Fogleman, chief of staff of the U.S. Air Force, will look back at the organization's 50-year history. Langley Theater, 7:30 p.m.

**March 26** "Geology of the Solar System." Alfred McEwen, director of the lunar and planetary lab at the University of Arizona, will present an illustrated tour of the solar system. Einstein Planetarium, 7:30 p.m.





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# GARY

## AND THE PIRATES





**SNAKES, MOSQUITOES, ICE,  
SWAMPS, JUNGLES, JAILS:  
TO AIRCRAFT SALVAGER  
GARY LARKINS, THEY JUST  
COME WITH THE JOB.**

by Carl Hoffman

*Photographs by Scott Highton*

**"T**wenty years ago there was a B-25 at every airport," Gary Larkins shouts above the thunder of the helicopter, "but those days are gone." The big twin-engine Bell 212 racing over the Alaskan wilderness is costing Larkins \$42 a minute, but for now, hunched in the jump seat, his long legs wedged behind 800 pounds of cargo nets, rigging straps, scuba equipment, power tools, two pistols, and a shotgun, the world's leading aircraft recovery expert has nothing to do but jaw about the state of his art. "Now, you've got to go further and further to find planes in worse and worse shape," he yells. "There's just not much

easy left anymore."

The 212 banks over the Yukon River and the log cabins of Ruby. Trash and sticks fly in the rotor wash and excited children swarm as we settle on the town's muddy beach. Larkins bounds out like a quarterback who's just taken the snap. The 200-mile flight from Fairbanks has already cost \$5,000 and the meter is still ticking. If all goes according to plan, however, by end of the day Larkins will have recovered a rare B-17.

Larkins is the director of recoveries for the non-profit Institute of Aeronautical Archaeological Research. He is to warbirds what Lord Elgin was to the friezes of the Parthenon. Amid skyrocketing prices for ever-rarer aircraft—last year a B-17 in flying condition fetched \$1.3 million—in a shadowy world of rapacious collectors, salvagers, treasure hunters, and big-talking wannabes, Larkins brings back the goods like no one else.

In 24 years Larkins has recovered 60 rare warbirds, 12 in the last three years alone. To fill the collections of aviation museums from Oregon to Florida he has fled communist guerrillas in the Philippines and pirates on the Sulu Sea. He has sneaked into the jungles of Burma with teak smugglers and once spent 10 days 264 feet under the Greenland ice cap (for which he won honorary membership in the Explorer's Club). He has, as he puts it, "dived in every sump hole from Maine to Manila."

But he has returned with Hellcats, P-38s, SBD Dauntlesses, B-17s, TBM Avengers, P-39s, Sikorsky flying boats, PBV Catalinas, Corsairs, P-47s, Lockheed Electras, and even a Bellanca Air-cruiser. It is a record that no other aircraft recovery organization or individual can match. Furthermore, his reputation remains intact. "In my experience, the IAAR is the best and most professional recovery organization I know of,"

*With a considerable assist from aircraft salvager Gary Larkins and a Bell 212 helicopter, pieces of a B-17F take flight again 53 years after the airplane crashed in Alaska. In his 24 years in the business, Larkins and a carefully selected band of friends have salvaged 60 historic aircraft.*





*The B-17's tail section beckons to its rescuers from a lake (below). Inhospitable conditions are typical of Larkins' recoveries; he claims the ever-present cigar (right) helps keep mosquitoes at bay.*

says Thomas M. Alison, curator of aeronautics at the Smithsonian's National Air and Space Museum. "Larkins knows what he's doing."

Larkins, his three team members, and the Bell's pilot, Jeff Reed, roll five drums of jet fuel onto the beach and unload the gear from the helicopter. Reed refuels the Bell. Rafid Tuma and Bill Roche struggle into wetsuits. Larkins spreads a cargo net in front of the helicopter, fills it with the gear, and attaches it by nylon cable to the 212's underbelly so it can be dropped when they reach the site. Don Carroll, Larkins' friend since high school and president of the IAAR, hustles a local to help unload whatever Reed will bring in.

In minutes we're up, the gear dangling in the cargo net, headed for the



"target"—a B-17F that crashed in 1943. It is mid-August. Below is a trackless green carpet of small pine trees, bushes, swamps, and lakes. Suddenly Reed drops over a lake: Below us, a silver-colored rudder and stabilizer rise ghost-like from the green-black water. A hundred yards away, the rest of the B-17

lies entangled in thick brush.

As we hover low near the fuselage, Larkins slides open a door and leans out, two of us clutching his belt. "Tell him to back up," he yells. "Okay. Perfect!" Reed drops the gear, then swings back out over the lake, now boiling with whitecaps from the 212's rotor wash. Tuma opens the door on the other side of the helicopter. The noise is deafening, the wind apocalyptic. He and Roche edge out onto the skids. Reed descends. Twenty feet. Ten feet. Five feet. The helicopter is shaking violently. Tuma and Roche leap into the frigid, roiling soup.

As they surface and signal "okay," Reed slides the Bell away in search of a clearing. He tries to land twice, but each time the trees and bushes are too thick. Finally, three-quarters of a mile from the B-17, he alights and Larkins and I jump onto the wet, spongy ground. Reed takes off to hover over the B-17 and guide us in. "He's wasting fuel; let's go!" says Larkins, leaping and crashing through brush so thick I can't see five feet in front of me.





Fifteen minutes later, scratched and mosquito-bitten, our feet sopping wet, we stumble onto the old bomber. It is charred and twisted, but worth every penny of the 15,000-odd dollars it's taken to get here.

Over the past decade a growing warbird boom has turned into a frenzy. Airplanes cranked out by the tens of thousands during World War II have become icons of romance and nostalgia. The most visited museum in the world is the National Air and Space Museum. And there are over 100 other aviation museums in the United States alone, as well as 20 or more serious private collectors. All are chasing a shrinking pool of airplanes. "The price of warbirds is going up, the price for their parts is going up, and there's more demand to recover the aircraft," says Florida salvager Peter Theophanis.

Fifteen years ago Larkins bought a stack of World War II gun turrets for \$35 apiece. Today, a B-17 ball turret is worth \$40,000. Twenty years ago it would have been insane to dig under 264 feet of ice in Greenland to retrieve a crushed P-38 (see "Iced Lightning," Dec. 1992/Jan. 1993). Got a crashed Hellcat lying in the lake behind your house? Make the right telephone call and pocket \$500,000. "Hell," says Theophanis, "ten years ago nobody even collected Hellcats."

In the summer of 1995 Larkins and his small team had plucked the B-17 *My Gal Sal* off the Greenland ice cap for Jack Erickson, millionaire warbird buff and owner of Erickson Air Cranes, who wanted to display it in the Tillamook Naval Air Station Museum in Oregon. The aircraft, part of the first bomber squadron to fly to Europe in 1942, had run out of fuel. It landed intact and the legendary polar pilot Bernt Balchen rescued its crew. Adding the value of a colorful past, Larkins figured the airplane's worth at \$2 million once restored. There was only one problem. During its half-century on the ice, the wind had flipped it, breaking the fuselage in half at the radio operator's compartment in the cen-

ter. But Larkins knew where to find a replacement. Though otherwise in ruins, the B-17 in Alaska has a nearly perfect center section that could be spliced into *My Gal Sal*. Erickson gave Larkins \$50,000 to salvage it.

At \$42 a minute, that doesn't go far.

In the field Larkins doesn't just work hard. He attacks. He is 46, tall, with thick black hair and eyebrows, a legacy of his Cheyenne ancestors. Larkins slips the clip into his semiautomatic .45 pistol and eight rounds of lead slugs into the shotgun (this is grizzly territory; two weeks later a lawyer from Washington, D.C., hiking nearby would be mauled to death). He lights a cigar, picks up his machete, and starts chopping down trees. A landing zone for the helicopter has to be cleared near the B-17. Carroll joins in with the chainsaw. The work is exhausting, the mosquitoes

*Divers Bill Roche and Rafid Tuma remove live 50-mm ammunition from the wreckage.*



big and hungry. A heady mix of sweet pine, gasoline, and chainsaw exhaust permeates the air. You can't just walk; with every step we stumble over and through brush that grabs us and launches clouds of mosquitoes and gnats. "This is a nasty place," says Larkins, hacking at a pine tree.

Suddenly Tuma and Roche appear, squelching through the bushes from the lake in their wetsuits. "There's a whole bunch of the tail there," says Tuma, a former Baltimore County police diver, "and it's all stuck in the mud."

"Hopefully the chopper'll pull it out," Larkins says. "Rig it up." His salvage agreement with the Department of the Interior requires that they remove as much of the airplane as possible. Besides, Larkins says, "it's all good stuff to have," and will be useful in one restoration or another. Tuma and Roche grab long nylon straps from the pile of gear, and disappear again into the dark waters.

Just getting to this point is a victory. Long before Larkins recovers airplanes he has to find them, a relentless process that claims tremendous amounts of time, effort, and money. "I've got the most complete catalog of salvageable aircraft in the world," he says, a catalog that includes the records of 47,000 U.S. Navy airplanes that have crashed or been shot down since 1910, as well as another 67,000 in the mishap reports of the U.S. Army and Air Force, all culled from the National Archives. If he's near a military airfield he drops in on the operations center seeking local mishap reports. And using those reports and the residents' word of mouth, he starts looking.

In 1992 he spent two months cruising the Solomon Islands in a rusty fishing boat. He found two Douglas SBD Dauntless dive bombers missing since August 1943 (and acquired a shrunken head for the souvenir-filled bar in his California home). As always, he videotaped the airplanes to woo potential clients and recorded their position by GPS for fu-





COURTESY GARY LARKINS (5)

*Larkins has traveled the world over looking for warbirds (counter-clockwise from above): in the Alaskan wild to get a Sikorsky S-43 flying boat, on a whaler off the coast of Greenland searching for a B-17E, on the ice cap with ex-Ranger Mike Swisley and the B-17 My Gal Sal, and in the ocean near Maui to recover the tail turret of a B-24 Liberator. Far right: Larkins (right) and fellow pirates Greg Winschell and Gary Steinheimer on the whaler. For the sake of appearances, the name "Air Pirates" had to go, but Larkins has kept the flying-skull logo—and the adventurous spirit.*

ture recovery. That same year he spent 37 consecutive days in a Bell JetRanger helicopter zigzagging over Papua New Guinea surveying 34 crash sites. The sites were identified by rough geographical calculations the airplanes' pilots had made and were as broad as 10 square miles. He discovered 15 P-38s: 11 were intact, and four or five probably restorable to flying condition. "I flew so much I got saddle sores," he says.

He has trekked, sailed, and dived throughout the Philippines, and towed his side-scanning sonar through waters from Hawaii to Greenland. Some of these journeys are more productive than others but they all carry a price. Although his trip to the Solomons yielded the location of the SBD Dauntlesses, for example, it also got him falsely accused of running guns and child slaves. The military police arrested him and threw him in a four-foot-square metal box, Larkins says. "I was feeling sorry

for myself until I looked through the slit and saw this Australian guy chained to a palm tree. His ear was hanging off and his whole face was bleeding and swollen. It would rain every day and night and I'd look out and he was just standing there." Larkins was in the box for 48 hours before the U.S. ambassador got him released.

In 1993 he hiked into Burma from Thailand in search of a Brewster Buffalo flown by the Flying Tigers. He spent a perilous and exhausting month, often waist-deep in leech-infested swamps, only to learn that he had been on a wild goose chase: The airplane had already been sold for scrap. Instead he brought back a potentially deadly blood infection transmitted by the leeches.

In 1995 he went looking for a ditched B-17 off the coast of Greenland. Dragging his sonar from a whaling boat, he worked 18 hours or more a day for 21

days in freezing rain and sleet, spent thousands of dollars—and found nothing.

Yet he sometimes finds airplanes almost by accident. In the background of a photo illustrating a late-1970s *National Geographic* story about native Alaskans, he noticed, he says, "a distinctive hull shape." It was the wingless fuselage of a Sikorsky S-43 flying boat, one of only three left. Three years later Larkins arrived in the village bearing a case of whiskey. The villagers led him to one of the Sikorsky's wings, which was being used as a bridge across a stream, and then helped drag the airplane 15 miles to the ocean. There Larkins loaded it onto a friend's cannery ship, which happened to be in the area.

Not every recovery is at the edge of the world. He once spotted an FJ-2 Fury on a pedestal outside the Sabre City Mobile Home Park in Roseville, California. He bought it for \$1. Today it hangs in the National Museum of Naval Aviation in Pensacola, Florida.



After two hours of hacking at the brush, we complete the landing zone and Carroll radios for Reed. He then slices the wings off the fuselage, the gas-powered quick-cut saw screaming as Carroll follows lines Larkins has spray-painted. Simply to walk or work around the airplane is difficult; there's a Gordian knot of razor-sharp aluminum, twisted hydraulic lines, and a tangle of two-inch-thick, 10-foot-high trees.

Tuma and Roche stumble in, having rigged the tail with nylon straps. But their air tanks are empty and they are exhausted and wracked with cramps. "Visibility is zero," says Tuma, gnats swarming around his dripping face. "All you can do is feel with your hands. You have to claw your way through dense underwater weeds. Twice, Bill got stuck and I had to pull him out."

Although each recovery is different and Larkins calls the learning curve "continual," he is following a basic game plan honed over two decades. Fly or sail in with a small, mobile, lightly equipped team, disassemble the airplane, rig it, and fly it out in large pieces by helicopter to a waiting ship or major road, all without breaking the bank.

He culls his team, always at short notice, from a cadre of divers and mechanics he's worked with for years. They include retired police divers, two former Navy SEALs, a former Army Ranger, and Greg Winschell, a.k.a. "the Indian," who earned \$20 a match sparring at an Oakland, California gym before going to work for Larkins. For this trip, Tuma got the call on a Wednesday to leave for Alaska that Friday morning. Roche,

a stand-in for his diving mentor, retired Baltimore police officer George Carter, heard from Larkins on Thursday night. "The longest notice I've ever gotten from Gary was three weeks, when he called to say we were going to Greenland for three months," says Tuma.

In 1990 at Carpenter Lake in Canada's Northwest Territories, Larkins streamlined his recovery technique further: He rigged an intact P-39 underwater, wrapped cargo nets around the wings to spoil their lift, and attached a drogue parachute to keep the airplane from spinning. In one motion, a Bell 205 helicopter lifted the P-39 out of the lake and flew it 250 miles to the town of Watson Lake, where it was trucked down the Alcan Highway.

The Alaskan B-17, however, hadn't been as lucky as the P-39. It had been heading to the Aleutians in 1943 to fight the Japanese when its number-three engine caught fire. The pilot had just seven hours of flight time in B-17s; the copilot had none. When the engine dropped off, the crew bailed. The airplane hit the then-frozen lake, broke apart, and plowed into the brush. The nose was crushed and the wings destroyed by fire. Two engines, a ball turret, and debris spread over hundreds of yards. But the center bomb-bay section lay intact in the brush and the tail,

connected to an unknown amount of fuselage, eventually sank in the lake.

"The big question is what will the center section and the tail weigh?" says Larkins, pausing to reposition a baseball cap bearing the IAAR's logo: a P-40 suspended beneath a Sky Crane helicopter. "Each should be about 2,500 pounds. But who knows? You can have all the manuals in the world but there's no way to estimate the components after a crash. If the chopper can't lift it, well, we'll just have to trim it all down somehow."

It's time to see. Reed attaches a 25-foot steel cable to the helicopter and takes to the air. Carroll, Tuma, and Larkins stand in knee-deep water on the lake's boggy shore, while Roche snorkels out to the tail. Slowly, Reed descends overhead. Sighting through two small mirrors mounted on the helicopter's nose and abetted by Carroll on the radio, he brings the shackle down to Roche, who attaches it to the nylon straps. The second he's finished, Roche swims like mad for the shore.

Reed throttles up and tries to rise. With the helicopter straining at full throttle just 25 feet overhead it feels like the end of the world. Reed works the load slowly back and forth. Wind-driven water slashes my face. We cower behind trees; Larkins, stogie clenched in his teeth, stands as if carved in stone, filming with his video camera. He, the cigar, and the camera are soaked.





Inch by inch 25 feet of fuselage and tail rise out of the water, the green paint and blue and white star-and-bar, outlined in bright red, as perfect as the day it was painted. From two side ports and the tail turret hang four .50-caliber machine guns. "God damn!" Larkins shouts. "Now we've got the whole damn airplane!"

Suddenly the turret breaks off and disappears into the lake. And Reed's 212, two turbines running at full throttle, can't fly with the load. All he can do is drag it to the marshy shore, drop the line, and land. No matter. Larkins is splashing through the swamp and clambering on the tail, grinning from ear to ear. He is sopping wet, covered with dirt, and hasn't had a bite to eat since climbing out of bed at five in the morning. But the guns look brand-new. "God, I love this shit!" he says.

"Sometimes I feel like Peter Pan," Larkins admits. "Everybody else grew up and I stayed the same." His father worked as chief line inspector at Douglas Aircraft (the logbook listing the aircraft he inspected includes the B-17 we're trying to recover) and later became a B-17 flight engineer. "I was crawling around the living room with pictures of B-17s and B-25s on the walls," Larkins remembers.

By the time he was in high school, he and his buddy Mike Swisley would jump the fence of a local fire-tanker pilot named Ralph Ponte ("Pon-tee"). "We'd sit in the cockpit of his B-25 and pretend we were bombing Tokyo,"

*The violence of the B-17's 1943 crash is still evident in the burned-out right wing (top), separated ball turret (center), and Wright Cyclone engine, partially buried in the ground. Though some of the components appeared to be hopelessly damaged, all are potentially valuable. Says National Air and Space Museum curator Thomas Alison, "That one engine alone probably paid for the trip."*



Larkins recalls. "One day Ralph caught us hiding in the airplane. He said, 'If you guys are going to sit in my airplane, the least you can do is to grab a wrench.'" Larkins worked with him for eight years, and Ponte, a taciturn former World War II torpedo bomber pi-



lot who flew fire-fighting tankers for 42 years, taught him everything an aircraft salvager needs to know.

In 1970, when he was 20, Larkins saw an ad in an aviation newspaper: The University of Utah was auctioning off an Allison engine. Thinking the engine would power one very fast car, Larkins' hobby at the time, he bid \$500. "Lo and behold," he says, "I was the proud owner of an Allison engine." Six months later the Confederate Air Force called. The Allison, it turned out, was a left engine for a P-38. "A guy said he'd like to come up and see it. I'm thinking maybe I can sell it to him for \$800. He offered me \$3,500. 'Okay,' I said, and away she went."

A month later, his mother-in-law, who was the Auburn, California city clerk, called to report that "an old airplane" would be auctioned off at the city airport. It was a Lockheed Lodestar that had been abandoned two years earlier. "There were two guys in cahoots who were going to bid till they got to \$1,500 and then stop," Larkins says. "But the auction required a minimum of three people. 'Hey kid,' they said, 'we need you.' They signed me up and when they hit \$1,500, I bid \$1,735." He got the Lodestar and called Ralph Ponte.

In a month he and Ponte had it fly-







*Don Carroll and Larkins clear the wreck's center section of debris and thick plant growth so it can be air-lifted from the site. Below, the tail section rises from the lake, its markings still bright after more than 50 years under water.*

ing and promptly sold it for \$20,000. He then went fifty-fifty with Ponte, chipping in \$25,000 for a half share in the very B-25 he'd once played in. A year and a half later, Larkins and Ponte traded the restored B-25 to the Air Force for a C-118 at Davis-Monthan Air Force Base in Tucson, Arizona.

"We worked 18 hours a day on that plane. I was 22, I had a brand-new baby girl, and I missed Thanksgiving and Christmas," says Larkins. "Me and Ralph were staying in an eight-dollar-a-night motel room with a broken door. After about three months I was ready to throw in the towel.

"Ralph knew I was upset, so one night he came in with a six-pack of beer and said, 'I know what's bothering you.' Cool, I thought, *we're finally going home*. But instead Ponte said, 'You know, paying eight dollars a night is killing us. There's no reason we can't move out to the plane and eat pork and beans.' And that's what we did. Old Ralph, he didn't want to stop until the job was finished."

After six months they sold the C-118 for \$200,000. They bought a P-47, a B-17, a P-38, and a B-26, all of which

they traded to the Air Force for two Hercules transports. (They became the first U.S. civilians to own a C-130.) Eight months later they sold the transports for a considerable profit.

By 1990, when the Institute of Aeronautical Archaeological Research was founded, Larkins had already recovered about 40 airplanes and had seen some profound changes in the aircraft salvage business. "You couldn't do it for profit anymore," says Don Carroll, because no one wanted to give away

treasure worth hundreds of thousands of dollars to a profit-seeker. And salvagers had to deal with more and more layers of government and institutional red tape.

On one of his earliest recoveries, in 1973, Larkins went searching for a Vultee BT-13 in the Sierras. "I went to the Forest Service to ask about getting a permit. All they said was 'Don't let the bears get you.' In 1978 he found an A-26 in a Kansas corn field, paid the farmer \$35,000 for it, and simply flew it out. More recently, when Larkins decided to recover the B-29 *Kee Bird* from northern Greenland, just getting the permits took seven years. (He eventually sold his interest to the chief backer of the project. During a recovery attempt by another team, a fire broke out, destroying the airplane before it could be flown.) Of the early recoveries, Larkins says, "They were like the last buffalo hunts."

The name of Larkins' original salvage company shows a little of the free spirit of those earlier times and, perhaps, a certain naiveté. He called it Air Pirates and had the logo—wings flanking a skull—tiled on the bottom of his swimming pool. "Now governments and bureaucracies are taking the adventure out of it," says Larkins. "I'm just glad I got in it when I did."





In 1991, Larkins became the IAAR's sole salaried employee and continued doing pretty much what he'd always done: locate aircraft and then find someone to pay the institute to recover them. Even as part of a non-profit, however, Larkins increasingly finds his days consumed with keeping permits and raising money, which often delay projects for months.

Between my first contact with Larkins and the Alaska journey, nine months passed and four projects fell through: one because of money, two because he failed to get all the requisite permits, and one because, after two weeks of using side-scanning sonar in Lake Michigan, he couldn't find the target. Because of the high false-start rate, the moment everything falls into place, Larkins strikes like lightning.

Having inspected the B-17's just-beached tail, Larkins bounds back to the center bomb bay section. He and Carroll rig a short, inch-thick steel cable around each of the four wing attachment points and connect those to two nylon straps. Reed spools up again and hovers over Larkins straddling the center section the way his hero, John Wayne, might have straddled a horse. Roche, Tuma, and I huddle close to the ground. Larkins fastens the straps to the helicopter's cable and bolts into the wildly swinging brush.

But try as he might, Reed can't budge the piece. It doesn't move an inch. After 10 minutes at full throttle, he gives up. Reed flies back and forth to Ruby ferrying an engine, a wing, and then a load of parts scoured from the brush. At 8:30 p.m. he calls from town saying he's exhausted and has to stop for the night. He returns and we jump in and head back to town, tired, dirty, hungry. "She's a mean old witch," shouts Larkins of the center section, "and this Bell doesn't have enough lift!"

As we fly toward the beach I can see the whole town heading through the dirt streets to watch us land. Children on their parents' shoulders, dusty pickups, clusters of boys on rough wooden go-carts, all surrounding the piles of



*Entertained by their leader's stories, the salvagers hunker down for the night in a simple plywood hut.*

wreckage already brought in. One local family invites us to stay in their children's log playhouse, complete with a rack of moose antlers over the four-foot-high doorway. The sun is an orange ball descending over the steel gray Yukon.

Huddled in the tiny room, over cold military-style packaged meals and fresh-smoked salmon strips provided by our hosts, the tales spin. Larkins is animated by a burning passion for warbirds and adventure, and when he's not actually turning a wrench or connecting a shackle the stories spill out in a mesmerizing torrent. There was the time he climbed into a PBY Catalina that hadn't been flown in 15 years and flew it from Hawaii to California. ("When we landed we lost the brakes. Finally, I tied a rope to my big old toolbox and threw it out the blister and dragged us to a stop.") And the time he, the Indian, George Carter, and longtime friend Mike Gregersen were in Papua New Guinea disassembling the P-38, which, as it turns out, was infested with snakes. "We had to sleep on the wings, but the snakes would crawl up into the airframe at night to get warm," he says. "You could hear them thunking and clunking all night long."

Larkins sucks on his cigar and takes a swig of whiskey. He continues: "The first night it was raining like hell and I was looking out into the darkness when lightning flashed and I saw three guys with spears staring at me. I grabbed my machete and then the lighting flashed again and they were gone. I slept with

my shotgun. In the morning we'd beat the aircraft with the flat edge of our machetes to drive the snakes out before working on the plane."

By six the next morning the helicopter is refueled, and 20 minutes later we're back at the B-17, attacking the center section. It is 55 degrees and the sky is as blue as the water in a swimming pool. Still, the mosquitoes

swarm. Carroll cuts away the pieces of nose that are still attached. With chainsaw, machetes, and knives—we haven't got a shovel—everyone else starts digging into the wet peat around the airplane. Sure enough, 50 years of roots are anchoring it to the ground. "And there I was doubting the 212," says Larkins, hacking at the ground with a machete.

Two hours later the helicopter roars to life and Reed takes to the sky trailing 25 feet of cable. He hovers over Larkins, who shackles the cable to the rigging and then jumps clear. It sounds and feels like 10,000 horses are galloping just overhead. Suddenly, up pops the center section, a ragged-edged aluminum hulk dripping 50 years of dirt and debris. Reed heads toward Ruby.

Tuma and Roche go in the water to scope the tail, while Larkins and Carroll try to figure out how to take—or saw—it apart. Suddenly Reed appears, hovers briefly over the lake, and radios Larkins. "The helicopter is broken," Larkins yells. "We gotta go. Now!"

He drops his tools, leaps over the quick-cut saw, and crashes into the brush. We follow him. Roche and Tuma in their wetsuits, to the clearing where the rest of the gear sits. The helicopter is there, thundering at full throttle. "Grab just your packs," shouts Larkins. We bolt into the helicopter like grunts being rescued from a firefight in Vietnam, leaving the tools, the rigging, and \$8,000 worth of diving equipment. Before the doors are closed Reed is up, doing 115 mph to Ruby.

The big B-17 center section, Reed says, had started spinning wildly. Just as he was backing over the Yukon to drop the load, the hook it was attached to—also spinning wildly and partially



recessed in the body of the helicopter—tore the bottom of the 212's fuselage and cut the throttle linkage to the number-one engine. Reed didn't panic. He set the center section gently on the dock and came back to get us.

But for now, the \$4 million helicopter is shot and the expedition is over. We land at the windswept gravel airstrip a mile outside the village. Reed finds a telephone and calls his office. A light JetRanger is en route from Fairbanks to extricate the gear and whatever it can lift of the B-17 from the site. Tuma, Roche, and I will fly out by commercial puddle jumper later in the day. Larkins falls asleep against the skids of the Bell.

That afternoon under a warm, late-summer Arctic sun, Charlie Hnilicka loads the wreckage onto his Yukon River barge, to be off-loaded in Fairbanks three days later: one broken, burnt-out wing, one engine, a pile of twisted cowl-

ing, hydraulic lines, oxygen bottles, odd switches, crew seats, a carburetor, miscellaneous sheet metal, and the big center section. Whatever Erickson doesn't need for *My Gal Sal* will be donated to several museums in Alaska. Truth be told, it doesn't look like much. But as the Smithsonian's Thomas Alison says, "That one engine alone probably paid for the trip. Little things as innocuous as a switch, a lever, or wires might be a real nugget needed for a restoration. Things that look like junk, those are the kinds of things we might be real interested in."

"Jack will be happy that we got that center section," says Larkins as the front-end loader eases the aluminum hulk onto the barge, "but I know what he'll say: 'You just stay up there until you get it done.' Well," Larkins says with a grin, "there's always a good bar in Fairbanks and a pretty woman to pour your whiskey."

A clatter overhead announces the JetRanger from Fairbanks; it swoops onto the beach. "Gotta go," shouts Larkins at a run.

The helicopter thunders into the

wilderness. In the sudden silence, Larkins' mantra tugs at my spirit: "Quit your job. Join the Pirates."

*In two more quick trips, Larkins brought out the gear and a valuable ball turret, which the helicopter set down on Hnilicka's already moving barge. In Fairbanks three days later the trucking company that had been contracted to bring the parts to Tillamook suddenly tripled its price, to \$16,000. So Larkins and Carroll rented a van and U-Haul trailer for \$2,600, strapped the pieces on, drove four days and nights straight down the Alcan Highway, and delivered the goods to the museum's front door.*

*A week later I found this message on my answering machine: "The Indian and the Ranger are here and we're leaving for Alaska to get that tail. A guy from Venezuela called and he wants me to come down and look at something sitting in a lake. And the Marines called. They want me to go back to the Solomons and get those SBDs." There was a pause, and then this: "If I had a million dollars, I think I might just go lay down for a while." —*

*Larkins inspects the just-recovered tail section, which will someday very likely be on view at an aviation museum.*





by Tony Reichhardt

In the summer of 1939, the members of the British Interplanetary Society may have been the only optimists left in Europe. Nazi Germany was steadily building up its military machine, and the continent appeared to be slipping inexorably toward another devastating conflict.

But the small band of English eccentrics that made up the BIS had their attention elsewhere. Their gaze was fixed on the coming age of space travel, and more specifically on the problem of sending a rocket to the moon. They had formed their organization in 1933—at about the time rocket societies were blooming in Germany, Russia, and the United States—dedicating themselves to “the stimulation of public interest in the possibility of interplanetary travel...and the conducting of practical research in connection with such problems.”

In fact science fiction writers like Edgar Rice Burroughs and H.G. Wells had already stimulated the British interest in space. But even though the

# H.M.S. MOON ROCKET

BIS members were almost all science fiction fans, they cringed at the way space travel was portrayed in movies and popular books. Writing in the February 1937 issue of the society's journal, D.W.F. Mayer, an associate member from Leeds, panned the film version of Wells' *Things to Come* for having depicted astronauts being launched by a space gun. After calculating that the resulting force on a 120-pound person would equal 435 tons, he chided, “If the Man in the Street is to be introduced to the possibility of space travel via the medium of films—especially films with

as much publicity as was given to *Things to Come*—it is up to the writers of them to make sure their facts are reasonably accurate.... Play the game, Mr. Wells!”

From 1937 to 1939, about a dozen armchair astronauts on the BIS “Technical Committee” played the game by carrying out the first detailed study of a manned lunar mission, from propulsion to payload to pressure suits. Rather than dream up an anti-gravity drive or some other staple of science fiction, they used only physical principles and technologies already in hand. Some of the ideas, like a propulsion system based on 2,000 solid rocket motors, would certainly not have worked, while others—aerobraking and a parachute descent to Earth, a three-man crew, and a focus on geological prospecting once the moon had been attained—proved amazingly prescient.

The BIS was not the first to consider the technical requirements of a lunar voyage. Rocket pioneers like Russian school teacher Konstantin Tsiolkovsky and German engineer Hermann Oberth



BRITISH INTERPLANETARY SOCIETY



had already done some thinking on the subject. The American rocket scientist Robert Goddard had been ridiculed in 1919 for suggesting that a rocket could be sent to the far side of the moon. But BIS members were the first to analyze a lunar trip in a systematic way and spell out possible technical, logistical, and physical challenges.

In 1937, having just moved its operations from Liverpool to London, the four-year-old society was looking for a project that would popularize the notion of interplanetary travel and at the same time “prove that we are a body which may be entrusted with a scientific task,” in the words of one BIS officer. They bypassed more conservative ideas, like building a rocket car or firing mail across the Atlantic, electing instead to design a two-week round trip to the lunar surface.

The choice of such an ambitious goal wasn't entirely high-minded. Unlike their counterparts in the United States and Germany, BIS members were forbidden by Britain's Explosives Act of 1875 from shooting off real rockets. Hands-on experimentation with live propellants was out.

The society was also broke. Its members were mostly teenagers and young men, and few had money for expensive equipment. “The research fund remains at microscopic proportions,” lamented one author in the society's journal.

So a careful, detailed, and cheap design study seemed just the ticket. A committee made of the few members who had at least some engineering or science background began meeting one evening a week, usually in someone's flat, to sketch out plans. Heading the Technical Committee was J. Happian (Jack) Edwards, the director of a small electronics firm. A brilliant but irascible Welshman, Edwards didn't suffer fools gladly. “There are plenty of mad scientists, but Edwards is the only mad engineer I ever knew,” says science fic-

*R.A. Smith painted a geologically ornate moon for the British Interplanetary Society expedition (opposite). The cover of the Society's journal unwittingly revealed the plan's fatal flaw: a honeycomb of solid rockets for every stage.*

Neil Armstrong  
was just a kid  
when the British  
Interplanetary  
Society hatched  
its plan for a  
lunar landing.

tion writer Arthur C. Clarke, who was also a member of the committee.

The 20-year-old Clarke was the group's astronomer. As a teenager on his family's farm in Somerset he had filled sketchbooks with drawings of lunar craters seen through a homemade telescope, and by 1938 he claimed to own every science fiction magazine ever published. Even before achieving world fame for co-authoring *2001: A Space Odyssey* and predicting the invention of the communications satellite, his friends had nicknamed him Ego.

The team included another electrical engineer, Harold Ross, and Viennese chemist Arthur Janser. Perhaps the most important member after Edwards was his childhood friend R.A. (Ralph) Smith. An artist and self-taught engineer, Smith was, like Edwards, a

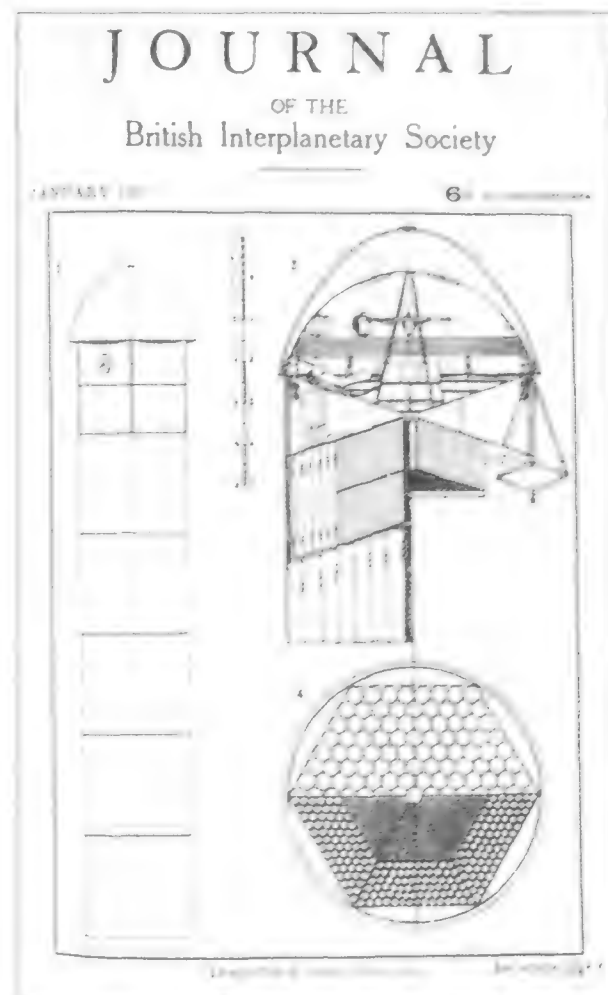
bit older than the rest of the BIS members, and married. His daytime job was designing the interiors of London hotels and cinemas, but he had drawn his first rocket ship at age 12, and space-flight was his true passion. A stickler for accuracy, his paintings brought to life many of the society's most important concepts from its earliest days until his death in the 1950s.

Smith's son Ashtyn, who later moved to the States and worked on the Apollo program, remembers watching through the banister as a seven-year-old while the Technical Committee discussed “propellants and mass ratios and such” in his parents' living room. “They were the most unusual bunch of people you could expect to run across,” he says. “Real visionaries.” Clarke recalls that interspersed with the technical conversation was “quite a bit of fun,” and that the group was never averse to sending out for fish and chips or adjourning to a pub.

Cash-strapped as it was, the committee decided nonetheless to try to build whatever few devices its meager experimental fund would allow. “We were in the position of someone who couldn't afford a car, but had enough for the speedometer and the rear view mirror,” Clarke later wrote.

Edwards designed an inertial guidance system—an aluminum disk with ball bearings, gears, weights, and springs attached—for sensing the spaceship's speed and position. The committee planned to test the device in the London underground but never got around to it. Another instrument—the coelostat—did get built, and actually worked. Because the spaceship would be spinning at one rotation every three and a half seconds, the astronauts would have difficulty seeing out the portholes to navigate. The solution was the coelostat, a periscope-like gizmo with two fixed mirrors and two spinning ones, which compensated for the ship's motion so the stars appeared stationary.

During one memorable meeting in Smith's suburban London home, Edwards orchestrated a demonstration of how the coelostat would work in principle, using, among other things, Smith's shaving mirror and his wife's compact. “Soon,” wrote a wry observer in the BIS bulletin, “the room was full of living







Arthur C. Clarke (far right) and other BIS members had a visit from rocket pioneer Robert Truax (holding the model) in 1938.

statuary, standing in graceful and artistic poses, holding mirrors above their heads." When "fatigue began to overtake the living statues, wobble set in," and Mrs. Smith had to rescue the "stricken Interplanetarians" with a tray of tea and sandwiches.

By January 1939 the committee was ready to show off its design in the more sober pages of the society's journal. The six-stage moon rocket weighed in at 1,000 tons and could deliver a one-ton payload, including three astronauts, to the lunar surface. Each stage, or "step," was a honeycomb of hundreds of tubular solid rocket motors—2,250 altogether—bundled together like sticks of dynamite. The sixth and final step would lift the vehicle off the lunar surface for the return to Earth. This "cellular" design—Edwards' idea—allowed the motors to be mass produced, which dramatically reduced the cost of the mission.

It was all very elegant. And totally impractical.

"Where we went wrong was in assuming we could use solids," says Clarke. The committee was well aware of liquid fuels, which even then were favored by most rocketeers. In fact, an affiliated astronomical society in Manchester, led by 18-year-old Eric Burgess, was designing its own moon rocket using "petrol and liquid oxygen." But, recalls Clarke, "we worked out that [the main vehicle] would have to burn X tons of [liquid] fuel per second,

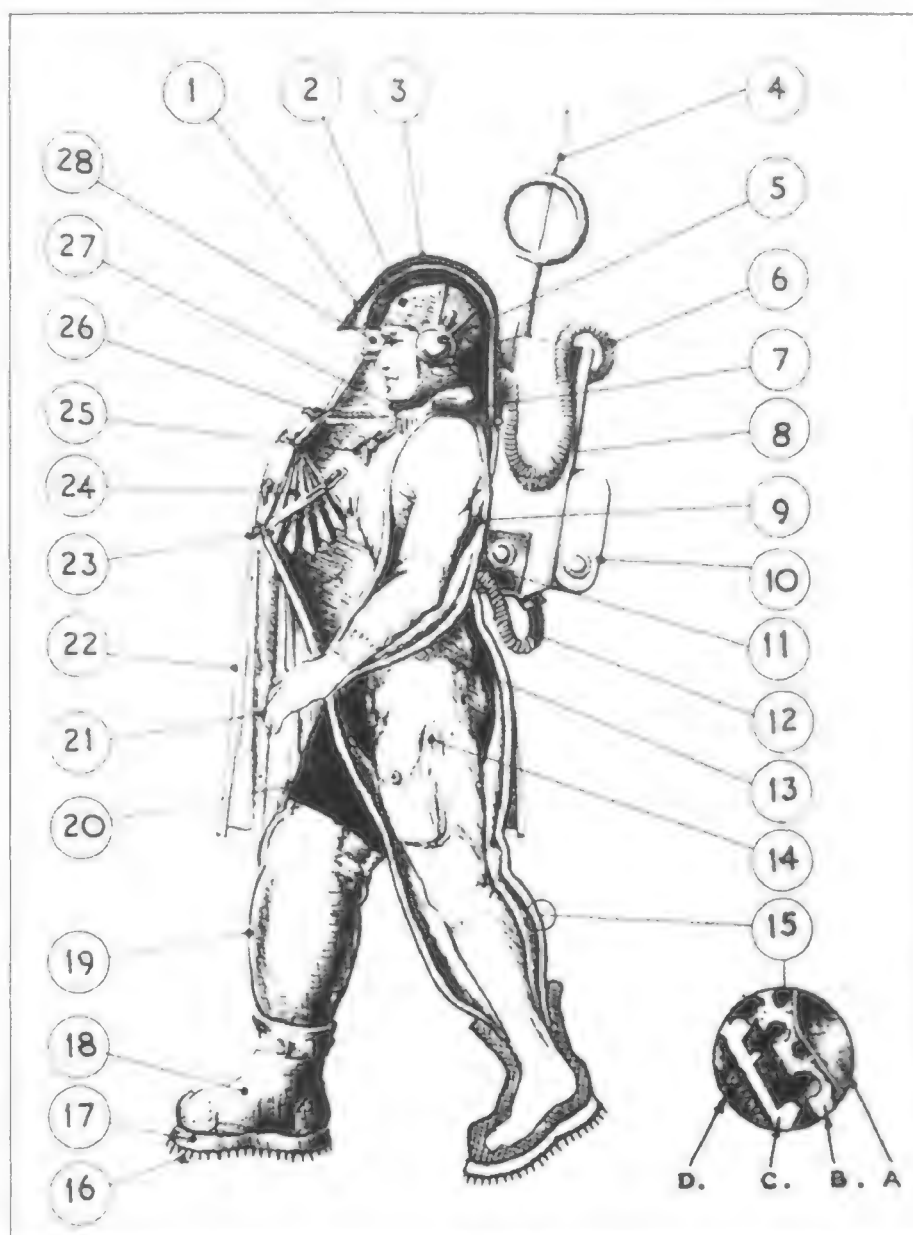
and no one could imagine pumps that could handle that." The BIS designers never suspected that over on the continent, a well-funded German team led by Wernher von Braun was on the verge of solving that very problem.

Working out the details of the vehicle's payload, which fell to committee member Maurice Hanson, presaged the hard decisions NASA engineers would face 30 years later. Every item

had to be chosen for compactness and minimum weight. Air and water would be extracted from a single tank of liquid hydrogen peroxide. The lunar explorers would carry, among other things, charts and books printed on "specially light rice-paper," indelible balsa wood pencils, two large handkerchiefs for each crew member, spacesuits made of "thin but tough" rubber or leather, flat shoes, dark goggles and sunburn lotion for working on the lunar surface, geological hammers, spades, a "fairly powerful" telescope and microscope for mineralogy, and a canvas tent to place over the ship to reduce heat loss.

Foods would be selected for high energy content: bread and butter, cheese, porridge, raisins, ham, honey, and salmon. Water would be the basis of all beverages, "chief amongst which will be cocoa, though a small amount of coffee might be necessary as a stimulant for navigators falling asleep over their interminable calculations."

The astronauts would communicate with Earth via "flashes of light." By modulating the intensity



The BIS spacesuit had the look of armor worn by Roman centurions, but every feature had a purpose: (1) an anti-glare peak on the helmet, (4) an antenna for radio communications, (6) an air pipeline, (9) "a roomy armhole to permit withdrawal of arm," (10) an air conditioning unit, (16-18) "pull-on" boots with articulated and spiked metal soles and inner thermal insulating soles, and, most dashing, (22) "silvered cape (used to regulate temperature at night)."



of the beam, wrote Hanson, "a running commentary by one of the astronauts on the exploration of the Moon, broadcast by the BBC, is not beyond the bounds of possibility."

Some of this was a little farfetched for even the other committee members, who had their hands full figuring out how to soften the spacecraft's impact on the moon, or just getting the damn coelostat to work properly. Time, money, and lack of manpower were chronic problems. A few members began to wonder whether the original prediction—that a mission could be launched in 15 years (always pending the timely arrival of £200,000, of course)—might have been a trifle too bold.

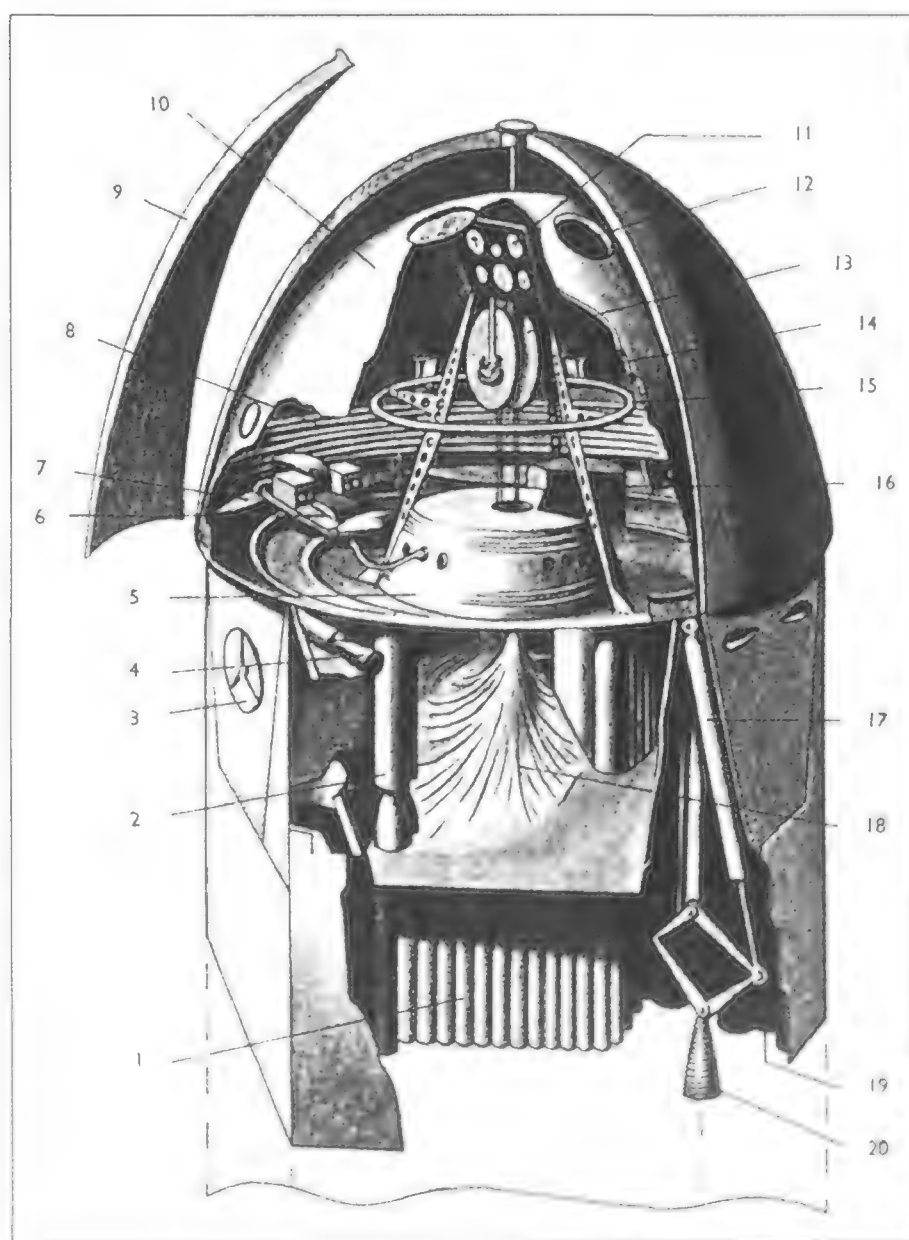
If the members were beginning to have doubts, outsiders already thought they were crazy. Leonard Carter, who joined the society in 1937 and still works in its London office, says that talking about moon travel before World War II "was regarded as a form of lunacy, and not a mild one at that. People would cross the road to avoid us."

The BIS membership set out to convince skeptics that their mission was possible. "We must explain that we are not peculiar people who desire to go to the moon like children who cry for a new toy," wrote President A.M. Low, who had helped develop radio-controlled guided missiles in World War I.

Society members gave frequent lectures and demonstrations, even showing off the coelostat at a science museum in Kensington. Clarke did his part to spread the faith, even though he was often rebuked by someone in the audience "for talking utter nonsense." After the war, he and fellow member Val Cleaver spent an evening in an Oxford pub trying to convince C.S. Lewis and J.R.R. Tolkien of the rightness of their cause. Neither writer joined the society, though eventually George Bernard Shaw did, at the age of 91.

The BIS moonship design generated a small flurry of publicity for the society in 1939, with articles appearing in *Time* magazine and publications from as far away as India. An editorial in the journal boasted that "once we stole half the photo-news page of a national Sunday newspaper from Herr Hitler."

But Hitler had the last laugh. In September 1939 he invaded Poland,



The final stage of the moon rocket was to settle on six landing legs (20), using steam steering jets (2) and spin control jets (4) to maneuver. Mission completed, the craft would blast off from the lunar surface propelled by a bundle of rockets (1) and jettison its heat shield after re-entry (9).

Britain declared war on Germany, and the society disbanded virtually overnight, as those members who hadn't already enlisted were called up to service. When the BIS reconvened after the war (R.A. Smith was instrumental in rounding up former members), its ranks were older, more seasoned, and more numerous. Wernher von Braun's V-2 had proven that rockets were no longer schoolboy fantasies, and now no one smiled at the idea of space travel.

The post-war BIS turned to more practical near-term tasks, including holding a landmark conference in 1951 to plan the world's first orbiting satellite. The society became, and remains today, an important incubator for advanced thinking about space technology, and its journal is one of the most respected in the field.

A few members of the original Technical Committee, mainly Smith and Ross, continued tinkering with the old moonship, publishing articles into the 1950s that refined the design. The post-war concepts were more sophisticated, at times coming close to what NASA actually launched a decade later.

Clarke went on to a celebrated career as a science fiction writer, and in

July 1969 he sat at the right hand of Walter Cronkite as a commentator on the first moon landing. His friend Val Cleaver became chief engineer of Rolls-Royce's rocket division. Burgess also became a successful writer and NASA consultant. Only Edwards seems to have peaked with his work on the BIS moonship. He drifted into alcoholism, moved to Ireland, and ended up choking to death on his false teeth.

R.A. Smith continued to collaborate with Clarke as an artist on several books and magazine articles, which earned him a small measure of fame. He painted, invented, played Chopin on the piano, and dreamed constantly of space travel. Several years before he died in 1959 at the age of 54, Smith quit the factory where he had been happily designing rocket powerplants and took a less rewarding job with a company that made pressure control devices. He didn't want to work on missiles, so out of principle he resigned.

Meanwhile, in Huntsville, Alabama, Wernher von Braun, a dreamer of a more pragmatic bent, was already hatching his own plans for a mission to the moon and a giant rocket that could take men there. ➔



# PORTRAITS

by Mayfield





Court photographer to the Wright  
brothers and pictorial barnstormer,  
William Preston Mayfield was the  
Mathew Brady of the Air Age.

by John Fleischman

*Photographs from the collections of Marvin Christian and Walt Burton*

**O**n week-ends, the trolley from Dayton to Springfield was always packed. Dressed in their best church clothes—brushed bowlers, flowery hats, starched linen—the passengers would get off at a stop called Simms Station. In 1910 it was little more than a country crossroads with a big shed nearby, but two brothers from Dayton were testing some flying machines there, and the crowds came out to have a look.

Among the on-lookers was a beanpole kid in a smart if slightly baggy suit who always carried an enormous folding camera. He was William Preston Mayfield, the lowliest photographer from the *Dayton Daily News*. Mayfield soon caught the Wrights' attention. They were photographers themselves, having documented all their experiments with gliders and powered aircraft. But the Wrights had grown too busy to take pictures, so the boy with the camera was useful. The Wrights' visitors invariably wanted a picture of themselves sitting at the controls of the brothers' astounding invention, and Mayfield was



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happy to oblige. Today, these pictures make up a photographic "Who's Who" of early aviation and technology. Here's A.B. Lambert, who became the president of the St. Louis Aero Group and the backer of Charles Lindbergh. Here's a very young Charles Kettering, who would soon perfect the first automobile you could start without a crank. Then there are the would-be pilots, the young men (and a few young women) who wanted lessons or a Wright machine. There are also people

whose identities are long forgotten but whose faces are unforgettable: One bewhiskered gentleman wearing a wing collar and derby hat sits in a parked Flyer, a grim hand on each control stick. He looks like he never wants to be higher off the ground than he is at that moment.

One of the portraits from this era is of a wind-blown teenager, his tweed cap turned backward in the approved aviator style. Snapped by Orville Wright himself, it shows Bill Mayfield, age 14, moments after he became, in all probability, the first American to take a photograph from an airplane.

During slow times at Simms Station, Mayfield would ask the brothers for a ride. Finally, one drizzly November morning, Orville Wright took him up. Mayfield brought along his camera, and the shot he got shows a lumpy pasture, the trolley line crossing left to right just behind the Wright hangar. In the right foreground is the landing skid of the Wrights' new Flyer.

*William Mayfield developed his craft while working for the Dayton Daily News, both in the darkroom (left) and out on assignment. In 1910 he took what may have been the first American photograph shot from an airplane (above), but his editor, underwhelmed, wouldn't run it.*





W.B. PHOTOGRAPHER UNKNOWN

The picture has a curious history. So many firsts were established at Simms Station—first circle flight, first takeoff in a dead calm, first commercial flight—that if Mayfield's 1910 aerial photo was a "first," nobody noticed. Mayfield raced it to town to show his boss at the *Daily News*. "That's nothing but a big empty field," said the editor. "There are no people." He refused to run it.

Of course, photographs had been taken from balloons long before. As for photographs from airplanes, a cameraman from the Pathé news agency had shot newsreel footage on a ride with Wilbur Wright at Le Mans, France, in 1908, and a still photographer in Italy had taken a picture while flying with Wilbur in 1909.

But neither accomplishment diminishes Mayfield's. In 1910

action photography was still a tricky business, and despite his age, Mayfield was proficient with his camera, an unwieldy box device with a pop-up canvas hood and slide-in glass plates. It was no point-and-shoot gizmo. Flying for a few brief minutes over Simms Station with Orville, Mayfield faced a difficult challenge, and he met it.

Mayfield went on shooting in the right place at the right time. In 1917 Simms Station was subsumed into Wright Field, the Army Air Corps' new test facility; there and at nearby McCook Field, Mayfield recorded air races, war games, and the trials of experimental craft, such as the gigantic Barling bomber and inventor George de Bothezat's helicopter (it flew one minute and 42 seconds at an altitude of six feet).

Wars accelerate technology. During World War I, U.S. troops had taken over a million reconnaissance shots; after the Armistice, men who had learned aerial photography came home looking for ways to use those skills. Across the country they started up "aerial survey" companies. In 1924 Mayfield and J.C. "Slim" Gregory, the pilot he was using for aerial work, decided to try their hand at such an operation. They teamed up with a colorful stunt flier named Roscoe Turner. The man who would one day assemble a movie air force for Howard Hughes, win the Bendix trophy, race from England to Australia, and tour the country with a lion cub was, in those days, just another barnstormer.

The three men hatched a plan to crisscross the Midwest selling aerial "portraits" of businesses and farms. Turner provided a surplus Curtiss Jenny JN-4, while Gregory supplied a car to scout ahead and line up clients. When he had a prospect, Gregory would wire for the airplane. Between photo flights, Turner would take passengers up for joyrides. Mayfield provided a portable darkroom and cameras. He grew adept at developing his prints in hotel bathtubs, checking to see that he had gotten the shot before they flew on.

*In 1923 Mayfield was on hand when the Army Air Corps put the gargantuan Barling bomber through its paces. The following year, the photographer and Roscoe Turner (above) teamed up for a profitable eight-state aerial photography/barnstorming tour.*





Mayfield's early work included both documentary photography, like the picture of the 1913 Wright Model E exhibition craft at right, and more formal works, such as the portrait below, which shows aviator Ruth Law in her new Wright airplane.

When Franklin Roosevelt called on Mayfield's boss, Dayton Daily News publisher James Cox, in 1920, the photographer snapped what would turn out to be a rare picture of the statesman walking (bottom).



In 10 weeks, the trio went through eight states and cleared a total of \$6,000. "It was easy to sell aerial photographs," Mayfield recalled later in an interview with *Dayton U.S.A.* magazine. "Not because they were so superior, but simply because they were taken from an airplane." Turner went on to barnstorm alone, and Mayfield returned to Ohio.

He prospered. In those years Mayfield sported a Clark Gable pencil-line mustache, favored wide-brimmed hats, and drove a snappy Packard roadster. Besides aerial jobs, he worked as a news photographer and newsreel cameraman, covering wrecks, conventions, and fires. He shot the celebrities of the day—Babe Ruth, General John Pershing, auto racer Barney



Oldfield. He got a picture of Franklin Delano Roosevelt walking, shortly before polio struck him. And he shot river baptisms, the opening of a movie house in a snowstorm, and a Wild West troupe that traveled around to fairgrounds reenacting Custer's Last Stand and Roman chariot races.

He also maintained his relationship with the Wrights, serving as the brothers' unofficial photographer. One Mayfield photograph shows Orville in tie, vest, and suit trousers, wading up to his knees in the Great Miami River during the testing of a floatplane. Another captures a Wright family picnic (not one of the nine people present is smiling). Mayfield chronicled Wilbur's horse-drawn funeral procession in 1912, and later, Orville's long twilight career as Last Living Wright Brother. He caught Orville wearing a silly hat and a rare grin during a surprise birthday party at the Dayton Engineers Club in 1925. Today the Wright legend is so encased in bronze that it is startling to glimpse Orville Wright as Mayfield bumped into him in the late 1940s, a white-haired old man buying a magazine at a newsstand.

But throughout his career, Mayfield's strongest passion was for aerial photography. He got his greatest aerial news scoop—and had his closest brush with disaster—in 1937, when Pathé News assigned him to take footage of the century's worst flooding in the Ohio Valley. Mayfield had just purchased a new Travel Air airplane, and he and Slim Gregory flew to Marietta along the Ohio, where they turned to follow the rampaging river downstream to Cincinnati. The devastation was dreadful to witness but great to film, and by the time Cincinnati hove into view, its rail and road bridges awash, Mayfield had shot nearly 5,000 feet of film. He signalled Gregory to come in low over the city's waterfront so he could film the flooded downtown. As





*At this family picnic, some clever Wright set a teakettle on the car's running board so that the hot pipes underneath would keep the tea warm. (Orville is at left.) Mayfield's association with the family continued until Orville's death in 1948.*

*Even sloshing around during a trial of his 1913 floatplane, Orville kept up appearances (below).*

they dropped to within a few feet of the river, the engine coughed and died. The main fuel tank was empty.

"I saw Slim fumbling for the switch to cut in the emergency supply," Mayfield recalled in a 1950 interview with the *Columbus Dispatch*. "It was in a different spot—down by the seat—than it had been in our old plane. Slim was trying to



find it near the roof of the cabin.... 'Down by the seat, Slim!' I yelled. 'Down by the seat!' Slim, meanwhile, was fumbling for that switch, and the bridge ahead of us was getting bigger and bigger.... We couldn't go below the bridge because the flood waters were too high. There wasn't enough clearance.

"All this happened within seconds but it seemed like years," Mayfield recalled. "Slim started to maneuver into a turn to avoid striking the bridge, and the wingtip almost dipped into the river." Fumbling blindly, Gregory's hand caught the switch for the auxiliary tank. The engine came to life, and they cleared the bridge by inches.

After they touched down safely in Dayton, Gregory remained in the pilot's seat so long that Mayfield walked back to ask what he was doing. "Practicing," said Gregory, flipping the auxiliary switch over and over.

Through the 1930s, aerial photography evolved from a performing art into a technical science. Back when Mayfield, Gregory, and Turner were out barnstorming, anyone with an airplane and a camera could make money selling "pictorials," oblique-angle shots of farms, factories, and towns. But the Depression carried off much of the "oblique" trade, recalls Harry Tubis, a civil engineer who got his first job in





*The owner of this theater wanted an impressive publicity shot, so Mayfield suggested he keep the box office closed until a large crowd had congregated outside.*

*Mayfield's greatest news scoop was his documentation of the 1937 flooding of the Ohio Valley; the picture below shows a steamer struggling upstream past a flooded power plant.*



aerial surveying in 1928. The coming thing was photogrammetry—a method for systematically surveying an area with a vertically mounted camera shooting through the airplane's floor.

Tubis, now 90, was one of the pioneers of the new practice; back in 1934 he and a handful of colleagues founded the American Society for Photogrammetry (which later added "and Remote Sensing" to its name). Photogrammetry was the first form of aerial photography that required carefully disciplined flying over long distances. A photogrammetric survey consists of strips of images that, when joined, produce a seamless picture of the terrain; to create such a composite, the pilot must fly perfectly level at a constant altitude along a set course, with the groundspeed matched to the camera's timer so that the exposures overlap correctly.

Mayfield kept up, mastering the new discipline. Lloyd Herd, another early member of the American Society for Photogrammetry, recalls flying with Mayfield in 1937 to check out his technique. At the time, Herd was the chief aerial engineer for a New Deal agriculture agency and was contracting aerial surveys to cover the state of Ohio. The idea began in 1934 with a single county, shot in a few days' flying. "The trial worked too good," says Herd. "It never worked that well again." Three years later Herd was still wrestling with Midwestern cloud cover, storms, and a shortage of qualified aerial photographers. That's why Herd went up in May-

field's tiny Fairchild 75, squeezing himself in with the photographer, pilot, and bulky camera. Herd recalls that the heavily loaded Fairchild had to claw its way up to 14,000 feet. "Those planes were built to be as light as they could be," he says, "and with a third person on board, I think at one point we were almost flying backwards."

In addition to the old-fashioned obliques and the technically demanding verticals, Mayfield's studio had a brief flurry of assignments for a third kind of aerial photography: air-to-air portraits of corporate aircraft. Lenny Ritz, a photographer who twice went to work for Mayfield after World War II, remembers going up with the photographer and his pilot to assist on an air-to-air assignment. The studio's Cessna Airmaster C-34 had had two of its four seats





W.H.

would wangle his way in to see the president of a large manufacturing company. Brandishing a five-foot-long print, Mayfield would convince the man that every up-to-date corporation needed such an aerial portrait of "the Plant" to hang in the boardroom.

Mayfield also got regular work photographing quarries and utility plants so that engineers at those sites could gauge the need for supplies. Christian's job was to drive out to the facility and lay out striped plywood panels at intervals to indicate scale. "It was maddening, particularly as you had to be there and all finished by the time he got there with the airplane,"

removed; "I was sitting with my feet dangling out of the aircraft and a rope around my waist," Ritz recalls. "Bill was supposed to be holding the other end of the rope, only Bill wasn't holding the rope. It was sitting in his lap, and he was talking or really yelling at the pilot instead. I can't remember who was flying, but I was sure glad he didn't bank or turn just then."

Though Mayfield had a pilot's license, he always hired a commercial pilot to take him up. His Fairchild camera, the size of a small cannon and fitted with special pads and webbing, kept him too busy to do any flying himself. Stationing himself in the open doorway of the airplane, Mayfield would plant one foot outside on a strut and have the pilot come down as low and as slow as he could bear. Above the wind the photographer would shout: "I'm all right if you're all right!"

In the 1950s, Mayfield's aerial work was mostly industrial—photographing railroads, construction sites, interstates, and factories. Marvin Christian, who landed a job at the studio in 1955, a year out of high school, recalls how his boss went about getting these assignments. Typically, Mayfield

Christian recalls today. "Then if Bill decided the conditions weren't right, you'd pack it all up and try again, same time, next day."

Lenny Ritz also remembers that perfectionism. During his second stint working at the studio, Ritz was supposed to help Mayfield's son-in-law, Bob Rogers, manage the business. (Mayfield's wife Babe and their daughter, Mickey, were also involved in the somewhat chaotic operation.) "I would have customers calling up and saying: 'When are you going to shoot this picture?'" Ritz recalls. "Well, it was just a picture to them, but to Bill, it had to be just right."

*Airshows were huge draws in the 1920s; the Mayfield aerial above shows the crowds that turned out for an exhibition near Dayton.*

*Mayfield's subjects ranged from the rare to the ridiculous. In 1922 he photographed inventor George de Bothezat's helicopter at McCook Field; the comically ungainly craft flew for 102 seconds and reached an altitude of six feet.*





Despite Mayfield's undimmed enthusiasm, by the late 1950s his aerial survey work was beginning to dry up. The photographer continued to keep up with the latest aerial equipment and technique, says Christian, "but the vertical business was going away from him and into those big engineering consulting firms. Bill just couldn't compete with them." The consultants did their own aerial work as part of a complete package—survey, site selection, and design. At the peak of his aerial business, Mayfield had owned two aircraft; by 1960, he had none. He still got aerial jobs, but he chartered the aircraft.

In 1967, Mayfield, by then semi-retired, sold his photographic assets to his former assistant. To weed out duplicates and make identifications among the 100,000 stock images, Christian enlisted Mayfield's help. "He had a fantastic memory," Christian recalls. "You would ask him about some shot he took in 1922. He'd say, 'Oh, it's in that yellow Kodak box.' And he'd go over and pull out the third box from the

bottom. And there it would be. He could identify five out of the six people in a picture he had taken 40 years before. Of the sixth guy, he'd say, 'I never did find out who that fellow was.' Every so often, he'd pull out a glass negative and hold it up to the light and say, 'Why, that's old so-and-so. That s.o.b. never paid me for this picture!' And *smash*, he'd throw it into the barrel before I could get a look."

But the aerial negatives he always handled gingerly. Shooting from on high remained Mayfield's great love. Even after he sold his studio, Mayfield kept his hand in, shooting "obliques." He made his last within a year of his death in 1974, at 78.

In his Dayton studio, Christian still keeps the giant prints in the yellow boxes that Mayfield always used for sales calls. Christian unrolls a few samples; they are the size of small blankets. The clarity is astounding. In a shot of the General Electric aircraft engine complex near Cincinnati taken in the late 1950s, you can see a woman weeding her garden just beyond the plant fence. A 1940s aerial of downtown Lima has a razor-sharp man feeding a razor-sharp parking meter. No one makes images quite like these today. There isn't the market. There isn't a Mayfield. If he wasn't the first aerial photographer, Mayfield was the last of his kind. —

*Taken in the 1940s, this picture shows the photographer in an airport workshop. All told, Mayfield's photographic career paralleled seven decades of aviation history.*







*Few people may remember the OV-1  
Mohawk, but its distinctive shapes and  
bulges gave it an unforgettable profile.*



Say Goodbye to Grumman's triple-tail,  
bug-eyed, heat-seeking camera platform.

# THE LAST OF THE MOHAWKS

by John Sotham

*Photographs by Erik Hildebrandt*







## VIETNAM MEMOIR

**K**orea's demilitarized zone is the world's most elaborate tripwire, a ravaged strip of mine fields, barbed wire, and tank traps designed to slow an invasion. From fortified po-

sitions south of the zone, U.S. and Republic of Korea soldiers peer northward as if watching a long-dormant volcano for signs of eruption. They know that North Korea could react at any moment to its current dire economic condition by launching a military foray into the South.

But for years U.S. commanders have relied on a set of eyes that look deep into the north from a vantage point high overhead and miles south of the DMZ. These eyes can instantly spot any vehicle movements and record them on film that is processed in seconds to be scanned and relayed to the ground. If even one truck were to move anywhere within a vast area to the north, U.S. commanders on the ground would know it within minutes. This powerful vision belongs to a combat-proven airborne radar system, and the system is mount-

COURTESY PAUL REED



*From personal albums: Paul Reed (standing, second from the left) wrote the operational plans for the first Mohawk platoon in Seoul, Korea. One unlucky OV-1 overran the runway at Vung Tau in Vietnam (below).*



AMERICAN WINGS AIR MUSEUM ARCHIVES





*Mike Langer (left) circles Anoka County Airport, home to his American Wings Air Museum, where the history of the OV-1 and those who flew it is stored (below). Lycoming T53s also powered the Bell UH-1 Huey (center).*

ed aboard one of the oddest looking tactical aircraft that has ever served the United States in combat: the Grumman OV-1 Mohawk. The Mohawk is also the only fixed-wing aircraft ever built specifically for the U.S. Army since the Air Force became a separate service in 1947. In September 1996, it flew its last mission over Korea and was retired after nearly 40 years of operations in two wars over some of the most hotly contested geography on the planet. Despite its distinguished service record, the Mohawk remains largely unknown outside the small communities of men and women who flew, maintained, and loved the small, ungainly-looking aircraft.

"It's an unsung hero," says Russ Wygal, a pilot with the Army's 224th Military Intelligence Battalion at Hunter Army Airfield in Savannah, Georgia, the last stateside unit to fly the Mohawk. Wygal says that when he tells people he flew an OV-1, they often confuse it with the North American OV-10 Bronco, a twin turboprop developed specifically for counter-insurgency campaigns like the Vietnam war. "Then I have to describe what it looks like," he says. "It's not like an F-14 Tomcat, where everybody goes, 'Ooo, aah, Top Gun.'"

The OV-1 finally retired because it had been superseded by newer systems, newer aircraft, and the evolution of the satellite, which had been little more than a symbol of cold war one-upmanship when the Mohawk made its first flight on April 14, 1959. The OV-1 was designed to meet a joint Marine Corps-Army requirement for a short-takeoff-and-landing battlefield surveil-

lance aircraft. It was intended to operate close to the front lines in support of unit commanders, and after the Marines dropped out of the project, development was continued for the Army. The first version, designated OV-1A, was configured to provide a platform for photographic and visual reconnaissance. Because form followed function, the result was an airplane with a large, bulbous cockpit, slender fuselage, and odd triple-tail arrangement; it looked like a



cross between a helicopter, an airplane, and an insect.

The initial design called for a T-tail, with the horizontal stabilizer set atop the vertical fin, but because the aircraft had handling problems at low speed, Grumman adopted the Lockheed Connie-style three-tail arrangement. Two Lycoming turboprop engines sit atop the Mohawk's wings. Like many multi-engine airplanes, its engines are canted outward to improve handling when the aircraft is flown on only one engine. But Wygal, who was required to practice single-engine flight during training, likened the rudder pedal force required opposite the dead engine to being "in a gym doing leg presses with only one leg. It's very demanding."

The OV-1's roomy cockpit features large, bulging side windows that give the airplane a bug-eyed appearance and allow an unobstructed view of the ground immediately below. The pilot sits on the left, and a technician or observer sits on the right. Unlike other tactical aircraft in which the crew sat side by side, like the Air Force's F-111 or the Navy and Marine Corps' A-6, right-seaters on the Mohawk were almost always members of the enlisted ranks rather than officers. They were primarily responsible for monitoring the panoramic camera and surveillance systems







while providing another set of eyes to scan the terrain below. Once it was in the air, there were no blind spots below: "You can lift the Mohawk 35 feet in the air and the pilot's vision and ob-

*Pilots and ground crew at Hunter Army Airfield near Savannah, Georgia, tended their OV-1s before the airplane's 1996 retirement (above and below right). Langer and his museum have 13 airframes, two of which are flyable, and they are busy accumulating parts and systems (below).*

server's vision will converge at a point directly underneath the aircraft," says Joel L. DiMaggio, who, as a Grumman production line worker, began an association with the Mohawk that would last the lifespan of the airplane.

The next version, the OV-1B, incorporated side-looking airborne radar (SLAR), which would ultimately shape one of the airplane's primary missions throughout its service life. The radar's antenna was contained within a long boom—like a big railroad tie—that was mounted below and to the right of the fuselage centerline, giving the Mohawk



an even gawkier appearance. As the airplane flies along its assigned track, the radar creates a strip map of the terrain below and on either or both sides of the track. With this system, the Mohawk also gained the ability to detect moving targets, which would prove immeasurably valuable in Vietnam, along the borders of the former East Germany, along the DMZ in Korea, and ultimately, during the Gulf War. Over the relatively open terrain of Korea and Europe, Mohawks gathered SLAR intelligence by repeatedly flying over the same tactical areas and comparing the images.

"The reason you do it every day is that [the SLAR] is a surveillance and







*The side-looking airborne radar (SLAR) that hung below the Mohawk's belly produced a running strip map of the terrain beneath the airplane's flight track and was capable of detecting vehicle movement (left).*

intelligence system, rather than just a target locating system," DiMaggio says. "You start out with a clean slate, look out there, and make a count on a road in East Germany, for instance, that normally has a certain number of vehicles going from one point to another. When things get hot, you begin to see more vehicles in different places—that's how you gather intelligence: by noting changes." DiMaggio, who after working on the Mohawk assembly line served four years in Germany and a year in Vietnam as a Grumman field representative, says that Mohawks could detect trucks and vehicles with SLAR and, using their infrared detectors, the hot engines of vehicles under cover at night. Once they were located by Mohawks, the targets could be attacked by fighter aircraft.

Successful SLAR missions required the Mohawk to provide an extremely stable platform while the radar scanned the land below, so most were flown on autopilot. However, straight-and-level is not the preferred flight orientation for a combat pilot. "It made you a sitting duck," said Gerry Durnell, who flew the OV-1 in Vietnam.

The OV-1C was the first Mohawk to

be equipped with infrared systems, and they proved valuable for detecting Viet Cong guerrilla units, which were normally small, mobile, and hard to find. "The infrared Mohawks were able to pick up the heat from VC cooking fires," says Paul Reed, a former imagery analyst with both the Army and the Central Intelligence Agency. "There were

a lot of VC that got very upset when artillery rounds came in on them while they were fixing breakfast."

The Mohawk's technological complexity gradually increased, but not the low-level, in-the-dirt nature of its missions. For pilots like Bob White, vegetation provided great protection as long as you kept the trees away from your wings. White was shot down while on a visual reconnaissance mission over the Mekong Delta in 1969. "We were real low, which was okay as long as you stayed close to the trees so you weren't in view very long. But we came out over an open area, and I'm sure that's when I got hit." White, who estimates he was at 50 feet and 150 knots when small arms fire set his right engine ablaze, suffered a compression fracture in his back when he ejected. He was captured and became a POW.

When they weren't dodging trees or hostile fire, Mohawk pilots were coping with acute discomfort. "You'd just be ringing wet in the summertime, which was most of the time in Vietnam," Durnell says. Before they were equipped with air conditioning, Mohawks had







*An OV-1's aerial snapshot of the airport hosting the annual Oshkosh fly-in clearly pictures visiting cars and aircraft (left). Mohawk fans at their seventh annual reunion ensure that a memory of it will live on (below).*

only vents that let in blasts of outside air, and the huge expanse of plexiglass turned the cockpit into a greenhouse.

In addition to their Vietnam and European service, SLAR-equipped Mohawks began operational missions in 1963 patrolling the 151-mile-long DMZ separating North and South Korea. "Until they were retired recently, they had been flying the same mission [in Korea] day and night for the past 32 years," says Reed, who was responsible for writing the operations plans to place the first Mohawk unit in Korea. The Army is currently flying a militarized version of the de Havilland DH-7 turboprop commuter airliner equipped with a SLAR system until JSTARS (Joint Surveillance Target Attack Radar System) aircraft, converted Boeing 707s with powerful side-looking radar, begin patrolling the DMZ. The difference between the capability of the Mohawk



and JSTARS "is like comparing the abacus to the computer," DiMaggio says.

While many associated with the Mohawk understand the necessity to replace aging airframes and technology, some still question how quickly the information the Mohawk used to provide to front-line small-unit commanders will be distributed with new systems. "The Mohawk means more control on a smaller level," says Gulf War veteran Benny

Hardman, a former Mohawk pilot and maintenance officer. "It seems to me that in the military intelligence field, it's going to be much more difficult for good, quick, accurate information to filter down to the battalion commander's level with JSTARS."

Mohawks were to get one last chance to fly the type of battlefield support mission they were designed for. Mike Summerville, who spent more than six months in Saudi Arabia as an OV-1 crew chief and flightline supervisor during the Gulf War, says the Mohawk was tested by long missions and harsh conditions. As the conflict intensified, Mohawks from stateside and European military intelligence units were deployed to the Gulf to begin flying reconnaissance sorties. Summerville's unit deployed 16 aircraft across the North Atlantic to the Gulf region, flew 10- to 12-hour missions around the clock, and returned to Fort Hood, Texas, without losing an aircraft.

"Grumman Iron Works—that's the whole way to describe it, plain and simple," Summerville says, citing the time-honored slogan of reverence for Grumman-built aircraft.

Yet missions took their toll on men and machine alike. "When I didn't fly a mission, I was usually on the phone or the fax machine at night looking for parts," Hardman says. Hardman and his fellow pilots benefitted from field modifications to the Mohawk's SLAR boom, which was used to pinpoint Iraqi vehicle movements. "The Motorola guys helped us tweak the SLAR system out to its maximum range," Hardman says. The Mohawks flew pre-determined courses over friendly and unfriendly territory constantly scanning the desert for vehicle movements. In addition, special RV-1D Mohawks equipped to collect electronic-signal intelligence pinpointed and reported the location of Iraqi radar systems.





*A group of Mohawks nearing retirement look almost forlorn, but new technology will do their job better.*

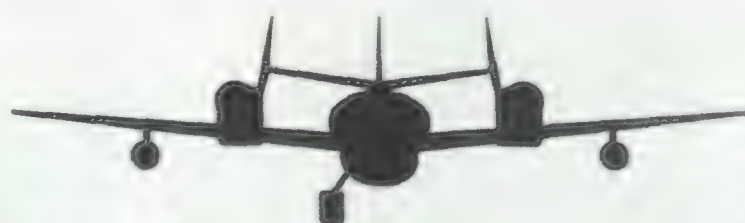
Crews of SLAR-equipped Mohawks provided instant intelligence results to airborne command and control aircraft and were data-linked to ground-based imagery analysts. "We could report 'Fifty movers along a ridge line,' for instance, and they could send an inbound sortie to attack the target," Hardman says. "We also talked to AWACS [Airborne Warning and Control System aircraft], who would let us know when there was a fast-moving aircraft coming in. Then we'd decide if we wanted to break track and get out of there."

Despite the Mohawks' dependable service in the desert, what the world saw on television were guided missiles piercing hangars and flying down airshafts while the OV-1s and their crews remained where they always were—in the background. "There were Mohawks in the air 24 hours a day, but they got absolutely no recognition," Reed says.

Exclusion from the headlines in its last campaign served only to strengthen the close-knit Mohawk fraternity. Its members became closer still when the OV-1's retirement came and went without fanfare. For most Americans,

it was like the passing of a distant relative: It's hard to miss someone you never really knew. As the OV-1 was withdrawn from service in steps—first in Europe in 1992, then from Korea in September 1996, and finally, after retirement ceremonies during that same

month, in Savannah, Georgia—there remained only one place for Mohawk lovers to turn. Elvis fans have their Graceland. Film buffs head west to Hollywood. For "Mohawkers," there's Anoka County Airport, north of Minneapolis, Minnesota.



#### **OV-1 Mohawk**

Grumman's Model G-134 won a 1956 competition for an airplane capable of operating near Army and Marine front-line units. The OV-1 was equipped with Martin-Baker J5 ejection seats, full-span leading edge slats, and air brakes on the fuselage aft of the wing. An armed version, the JOV-1A-GR, served briefly in Vietnam until it reportedly became the focus of an Army-Air Force squabble over its mission and was withdrawn from combat.







*Captain Frank Wary preflights his Mohawk and makes history; his unit is the last to fly the OV-1.*

Former Mohawk pilot Mike Langer, founder of the American Wings Air Museum, oversees a growing collection of aircraft used for reconnaissance, training, forward air control, and liaison, including 12 Mohawks in various stages of completion or restoration. The museum had three flyable Mohawks until a 90-mph wind gust severely bent one airplane's right main landing gear.

A partially restored Mohawk procured through a chance encounter with a military surplus catalog rests in the museum's hangar. "In paging through the catalog," Langer says, "I found that one of the aircraft available was the same Mohawk that I had put in at least half of my flight time in Vietnam. I said, 'I've got to have it, and I don't care if it never flies again....I've got to have it.'"

Langer, who had gained restoration experience working on a Beechcraft T-34 Mentor, submitted the winning bid

and trucked the airplane to Minnesota. Seeking help from Grumman officials, Langer received technical manuals and drawings but was told that only a non-profit museum or foundation was likely to obtain new parts. "I thought, there are a lot of little one-horse and one-hangar museums, particularly in the Midwest, and I've been able to pigeonhole enough interesting stuff in the last 15 years, so why don't I form a museum?" Langer says.

After four years spent securing donations and getting legal details ironed out, the American Wings Air Museum was born. Due in part to his insistence that the museum focus on the type of aircraft Langer and his volunteers knew best, the organization's credibility grew. "Our charter is four-fold: We're into photo reconnaissance, gunships, forward air control, and trainers," Langer says. "We're fairly knowledgeable, and we're beginning to be pretty respected in those areas."

Bob Johnson, a former Mohawk crew chief who served in Vietnam, knew nothing about the Mohawk Association, but

three years ago, a Mohawk flew over his house near an airport hosting a fly-in. "I just couldn't believe it," Johnson says. "I hadn't seen one since 1971." Johnson hurried to the airport, met Langer, and has been a faithful Saturday volunteer ever since.

"We do things right, by the book," says Dave Mattsson. A Northwest Airlines mechanic, Mattsson maintains all the operational Martin-Baker ejection seats found in the museum's Mohawks. "If I'm gonna go up in one of these things, I want to trust the pilot, and if I've got an escape system, I want to trust that too."

"Mohawks aren't going to retire up here," says Mike Summerville. "This will always be a home for them as long as there's someone to fly them and maintain them." The turboprop whine of the OV-1 may have been silenced by decisions made in distant Pentagon offices, but after the close of a 37-year career, the story will continue, at least as long as there are evenings and weekends free for Langer's volunteers to turn a wrench. —





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# COMMENTARY:

## Seek Answers, not Questions

Imagine two scientific investigations. In one, we know very little about the phenomenon under study—so little that even theories about it are incomplete. In the other, we possess a substantial body of knowledge and a well-formed theory or theories that allow us to make specific, testable predictions. Furthermore, let's assume that the basic questions associated with each investigation are of comparable significance, but that limitations in resources force us to choose between them.

Which investigation should be given the higher priority?

When we're considering the future of space science, asking this question is no mere intellectual exercise; it is a necessity. We are at a time of unprecedented continued advancement in space science. Yet it is also an era of diminished flexibility in the federal budget and increasing pressure for accountability in all programs. While it is not my intention to propose guidelines for national policy here, I would like to suggest a philosophy for setting priorities in planning space missions. A wise investor carries a mixed portfolio, and so must NASA's space science program. But the emphasis in the foreseeable future must be on missions that will, with reasonable certainty, advance our understanding on a small number of questions.

Experiments of the first type—those based on scant previous knowledge—have great potential for revealing important information. Yet they are a gamble. In a laboratory, information gained from an exploration of new phenomena can quickly—and generally inexpensively—be incorporated in a second generation of experi-

ments. But experiments in space are another matter: Getting new results requires great expenditures of both time and money. Because of this, I believe it is time to focus our research on experiments of the second type: those geared toward answering key questions and testing specific predictions.

When the space program was in its infancy, simply gathering data was often sufficient. Everything was new or unexplored. But today we have a great advantage over those who preceded us, for we can be guided by the knowledge they gained. For example, independent research efforts in biology, planetary science, and astronomy have for the first time provided us with a clear sense of the major course of our origins, as well as the steps that need to be taken

to address remaining key questions about how life came to exist on this planet and whether it might exist on others. This and similar foundations of knowledge must shape our space science program in the era to come.

Consider the investigation of Jupiter's composition, for example. It's been long known that Jupiter is a dynamically complex, heterogeneous body. Therefore, it should be clear from the outset that a single probe is not likely to provide a comprehensive picture of many aspects of Jupiter's composition. Another complication is exemplified by the Galileo probe's encounter with the planet. Data from the probe implies that the amount of water in Jupiter is less than expected, but that implication now appears to be in part an artifact of the probe's hav-

ing entered the atmosphere at an atypically dry region. Because our information came from only a few points in space and one hour in time, the available data is ambiguous. Our knowledge of the abundance of water in Jupiter—as well as what that abundance implies about other questions—has therefore not been advanced by the Galileo probe. To maximize the likelihood that new data will advance our understanding of the composition of Jupiter, a mission must build upon what we know in order to assure that it produces answers, not merely questions.

Another example is the search for extraterrestrial intelligence. A positive outcome from such a search would likely be the most profound result ever to emerge from a space science investigation—perhaps from science in general. However, our understanding of the manner in

DETAIL OF THE ATMOSPHERE OF JUPITER (NASA)





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## David C. Black suggests a new direction for the second generation of space science.

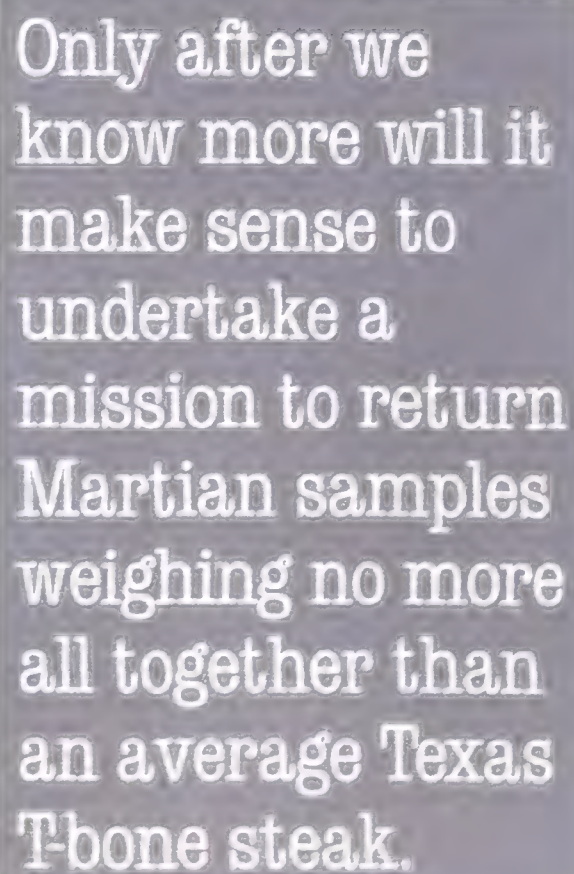
which such intelligence might communicate with other intelligent life-forms is at best rudimentary. Therefore, in any given survey or suite of surveys, the likelihood of success is very small—not because “they” are not there but because we may not be searching in the appropriate manner or at the right time. A null result offers no useful constraint on our understanding of the prevalence of extraterrestrial intelligence.

Recent results from studies of a Martian meteorite have been interpreted as evidence that life once existed on that planet in the form of what appear to be very small bacteria, or nanobacteria—a truly significant finding if correct. This has understandably led to an intensification of interest in missions to Mars and in the return of samples, particularly samples that may inform us about the possibility of life there. To put my philosophy for setting priorities and a course of action for such missions into practice, let’s begin by looking at what we know.

Our study of nanobacteria is in its infancy. Indeed, there are arguments among microbiologists as to whether these organisms exist at all. For the sake of discussion, let’s assume they do. We are just now beginning to know how to search for such organisms on Earth, where scientists are able to walk around in the field and collect ample amounts of material for analysis. Terrestrial paleobiologists would laugh if told that the only samples they could analyze had to be obtained by using remote-sensing data from low Earth orbit and be limited to the pound or so of material a robotic surrogate could collect. Yet this is, in effect, what planetary scientists must contemplate.

Therefore, to prepare ourselves for a mission—presumably a sample-return mission—that will convincingly address the remarkable possibility of past or even present life on Mars, we

first must learn enough about nanobacteria to shape missions that will enable us to test and advance that knowledge. Only then are we likely to be able to detect from space the likely locations of extinct or extant organisms on Mars. And only then can we go there and select a few pounds of samples with high confidence that when we return to the laboratory they will provide us with un-



Only after we know more will it make sense to undertake a mission to return Martian samples weighing no more all together than an average Texas T-bone steak.

ambiguous data regarding life there. Aside from a substantial research effort on the nature of nanobacteria, this will require a fuller characterization of Mars itself, particularly the history and location of water on the planet.

NASA’s current Mars programs are a solid step toward better understanding Martian geology, but they were framed to address the planet’s geophysical nature. If the search for past or present life is to be a focus in the near future, the planned Mars missions may need to be altered so that they will

provide a foundation for a sample-return mission.

Only after we are in a position of greater understanding will it make sense, given the limitation of resources, to undertake a mission to return samples weighing no more all together than an average Texas T-bone steak. Indeed, unless we can reach that position, other space science pursuits that can confirm informed predictions—concerning key questions, such as those about life, the location of water, the nature of planetary winds and atmospheres—should be given priority.

As the millennium draws to a close, we are able to look back on the accomplishments of NASA’s space science program as some of its greatest achievements. We have peered into the past and seen the beginnings of organized structure only 300,000 years after the Big Bang. We have witnessed the birth of stars and possibly of planetary systems. We have come to recognize that life on this planet and presumably others is influenced profoundly by astronomical phenomena, be it the variability of the sun or a chance collision with debris left over from the formation of the solar system. We have seen a diversity of worlds among the planets rivaling all that science fiction writers have imagined.

Our recent achievements impose on us awesome responsibilities. Now that we know what we know, what path should we choose to find out what we don’t know? For we do have a choice. We can strike out as our predecessors did, and uncover new tantalizing questions. Or we can go forward from the place where earlier investigators have led us, and obtain answers to questions that are of significance to the public, not just to space scientists.

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The author is the director of the Lunar and Planetary Institute in Houston, Texas.





# COMPANY TOWN

Residents of Friedrichshafen, Germany,  
aren't impressed by Concordes or 747s.

They ♥ zeppelins.

by William Garvey

*Photographs by Chris Sorensen*





By 1929, when the Graf Zeppelin circled the globe, its home port's chief industry had become airship building and its namesake a national hero.



**O**f the 50 or so people in the audience, none was more attentive than the handsome fellow seated closest to the door. Dressed in a blazer and well-pressed slacks, a silk handkerchief in his breast pocket, he had an aristocratic bearing, as well he should. It's in the genes.

The speaker went on excitedly about shipping times, distances, and lift tonnage, then focused on what he perceived to be "a hole in transportation technology for very heavy goods." This, he intoned, was the perfect opportunity for an airship. Not some skimpy blimp, mind you, but a leviathan, able to pluck powerplant turbines, assembly lines, 160-ton *whatevers* whole and fly them anywhere on earth. The audience attending the Second International Airship Conference nodded appreciatively. They liked big.

At the luncheon break, as arranged earlier, the well-dressed gentleman and I joined up. "A very interesting presentation," he volunteered as we strolled toward the nearby Buchhorner Hof hotel. When we entered the dark-paneled restaurant, the staff became noticeably energized. The manager popped up before us, and after a deferential exchange in German with my guest, he led us to a table. Although I did not understand the words, I recognize fawning in any tongue.

We'd barely touched our glasses of diet pop (his) and red wine (mine) when our silver-domed luncheon platters arrived. The roast pork was butter-tender and delicious. I doubt that this man has ever been served a bad meal anywhere within the city limits; it's probably against the law.

"The name 'Zeppelin' has a great sympathetic atmosphere," said my companion, trying for the right English words. "Everyone is attached to it." Certainly no more so than here.

We are dining in Friedrichshafen, a modest-sized city on the Bodensee, the large, pristine lake whose shoreline is shared by Germany, Austria, and

Switzerland. At one time not so long ago this scenic, out-of-the-way town was a center of world travel and, later, the center of an altogether different kind of world attention, all because of the vision and tenacity of a humiliated cavalry officer whose great-

grandson was sitting across from me, chewing.

Albrecht Graf von Brandenstein-Zeppelin is keenly aware that he is heir to a unique legacy. Although not in the business of airships and not even a resident of Friedrichshafen, he is respectful and supportive of those who are. He knows his family's name is revered here. Indeed, the town has assumed it as its own. To the locals, this is "Zeppelinstadt"—Zeppelin city—and a 15-minute walk in any direction will confirm that.

Zeppelinstrasse is the main drag into town. Eckenerstrasse, honoring the great man's most trusted aide and successor, is the main road out. You can get stuffed in the Zeppelin restaurant, buy your antacid at the Zeppelin Apotheke, and then collapse in bed at the Zeppelin Hotel. As do most of the town's bookstores, the Buchhandlung Kramer has a half-dozen books on Zeppelin the man and zeppelin the airship prominently displayed in its window, along with a 1997 Zeppelin calendar. An art store is selling paper *Graf Zeppelin* kits; the Hut Oess-Perrone hat store is featuring the old graf's (that's German for "count") signature white military cap.

You can buy handmade zeppelin-shaped chocolates, an eye-catching zeppelin tie, or a length of zeppelin wurst. Car bumpers sport hearts and zeppelins. Children scramble over a zeppelin jungle gym. The drum-and-bugle corps is named in honor of the old graf, as is the track club, the big lake ferry, and most particularly the opulent, modern Graf Zeppelin Haus arts and convention center that sprawls up from the lake shore. It is from here we have just arrived.

Were Friedrichshafen some backwater outpost with an unremarkable history, its burghers could be forgiven for grasping at anything that might distinguish the place and then flogging it for every pfennig it's worth. But this city is full of flowers, tony shops, handsome homes, and sun-splashed sailboats; the Alps fill the southern horizon. It's gorgeous. Trans-alpine traders have been coming here for a thousand years. The King of Württemberg made it the site of his summer palace. Nearly half a million visitors a year enjoy the cafes, hotels, parks, bike paths, playgrounds, and camping areas.

Friedrichshafen's 56,000 residents could easily ignore their town's role in a transportation experiment almost universally abandoned half a century ago. Instead they revel in it. "Here in Friedrichshafen," the



graf's descendant observes with a smile, "the clocks are going different."

That Friedrichshafen became the scene of aeronautical history is largely an accident of birth—Ferdinand Graf von Zeppelin's, in 1838. He grew up in a castle nearby. The Zeppelins were warrior-aristocrats closely associated with the Württemberg royal court. Young Ferdinand followed in the family tradition and became a cavalry officer.

Courageous under fire, Zeppelin advanced steadily in rank and responsibility. He had a mind for mechanical things, and with the Air Age dawning, he ruminated on the possibilities of a navigable air machine. In 1887 he wrote his friend the king (whose small realm had by then become a satellite of Prussia) proposing the development of a very large airship capable of carrying combatants, cargo, and bombs. Nothing came of it. And so, when General Zeppelin found himself elbowed out of the cavalry a few years later, he decided to build the thing himself.

There followed years of rejection and outright ridicule as Zeppelin kept trying to win sponsorship for his wild scheme. The guffaws went all the way to Berlin, where the kaiser himself dismissed the ousted general as "the foolish count from the Bodensee." But by 1898 Zeppelin had convinced several



*With a portrait of the count looking over his shoulder, Mayor Bernd Wiedmann (left) presides over a tourist town that capitalizes on the Zeppelin legacy (above). He is also the chief executive of the company that once linked two continents by airship (top).*



wealthy businessmen to pool 400,000 marks, to which he added an equal amount from his own fortune. Construction of Luftschiff Zeppelin no. 1 began.

Zeppelin went at things boldly. He constructed a fabric envelope 420 feet long and 38 feet in diameter, held rigid by a metal framework and buoyed by a series of bags bloated with 400,000 cubic feet of hydrogen. He built the LZ-1 in a huge lakeside hangar, there for all the world to see. On July 2, 1900, a tug towed the floating shed out into the middle of the lake. Then, with thousands cheering from vantage points on shore and afloat, the 62-year-old cavalryman-turned-test-pilot took his sputtering behemoth aloft.

It was a momentous day but a modest performance. LZ-1 was underpowered and difficult to control, and the project soon went belly up. But the count was undeterred. He mortgaged his wife's estates and built three more giants, the last of which brought him national acclaim as he toured Germany on a proving flight in 1908. Engine troubles forced him to land for repairs in a village near Stuttgart. During this pause a storm ripped LZ-4 from its moorings and the thing exploded.

Surveying the smoking debris, the old warrior seemed beaten at last. After investing two decades of his life and most of his family's money, after enduring endless ridicule and setback after setback, he was spent. He boarded a train for home.

But by then the German people had become captivated by the man's determination and enthralled by his magnificent machines. The foolish count had



been transformed into a national hero and international luminary. They wrote songs about him, put his white-mustachioed visage on everything from nutcrackers to purses. They wore white hats like his. They named flowers after him.

And upon learning of the disaster, they opened their wallets for him to build another zeppelin. The marks came from businessmen, from schoolchildren, from every corner of the Reich. All totalled, they gave him a staggering six million gold marks—roughly equivalent to \$30 million today—with no strings attached.

Zeppelin was overwhelmed and inspired to action. First he created Luftschiffbau Zeppelin GmbH—the Zeppelin Airship Construction Company—to develop and manufacture rigid airships. Second, he created the private Zeppelin Stiftung, or Zeppelin Foundation, and it was into this that he placed all the donated money.

The foundation's purpose was to promote the development of rigid airships, and accordingly, it bankrolled and controlled the company. But the count stipulated that if ever production and the advancement of rigid airships should cease, the foundation's money should be spent to benefit the people, since it was their generosity and faith that had made the enterprise possible.

Using land in Friedrichshafen donated by the king, Zeppelin built a development and manufacturing complex, complete with airfield, huge hangars, tooling shops, and administrative offices. The promise and momentum of the endeavor began attracting top-rate talent from throughout the Reich. And so the story would have continued, perhaps, had it not been for Germany's starring role in two world wars.

On a rainy day in early July 1996, Friedrichshafen's shorefront was a hubbub of festivity despite the weather. It was the grand opening of the Zeppelin Museum. Made wealthy by the count's providence, Friedrichshafen had



*Albrecht Graf von Brandenstein-Zeppelin, the count's great-grandson, is unofficial royalty in Friedrichshafen, where even the playgrounds sport zeppelins (below). Everything about the 1930s airships was oversized, including the 550-hp Maybach engine (bottom), five of which powered the Graf Zeppelin.*



invested in two projects to sustain its prosperity and pay tribute to its benefactor. The first was the \$50 million museum, a stylish celebration of the 1930s zeppelin era, housed within a Bauhaus-style former railroad station. It brims with touch-screen instructionals, busts, scale models, and such artifacts as logbooks, place settings, wooden propellers, massive diesels, and even a zeppelin engine pod the size of a Huey. The theory is that the museum will earn its keep by bringing 200,000 visitors annually.

The success of the other project is less certain but, despite its \$25 million cost, needs less justification. It's an airship, the







A re-created Hindenburg cabin dwarfs a 1930s sedan in the Zeppelin Museum (top). At the museum's opening, crew member Albert Stoffer (right) recalled the famous fire, which burned even the Hindenburg's engine pods (bottom). Airships in this city will always find fair winds (below).



first new zeppelin in almost three generations.

Zeppelin NT (for "new technology") sports neat gizmos like fly-by-wire controls and swiveling props right, left, and rear. This is no supership—NT is about the size of a Goodyear blimp—but, according to Bernd Wiedmann, mayor of Friedrichshafen and overseer of both projects, it is only a beginning. Plans are well under way to build much larger NTs with cabins big enough to carry 50 or more passengers on sightseeing flights over the wonders of the world. He believes a new zeppelin era is at hand.

If you harbor doubts, go elsewhere. You'll find no kinship here. Twenty thousand people, mostly locals, thronged the museum on opening day. Among them were a few white-haired oldtimers whose eyes shone. They were the living continuum; they crewed the great ships.

Georg Hall, an 85-year-old Friedrichshafen native, said his 94 Atlantic crossings on the



*Graf Zeppelin* were fantastic. Hall worked for the Luftschiffbau Zeppelin in its golden age. Presided over by Hugo Eckener, the airship company rose from the ashes of World War I to create luxurious, long-range passenger ships. In 1929 the *Graf* fired imaginations by circumnavigating the earth—visiting Tokyo, Los Angeles, and Lakehurst, New Jersey, on the circuit. Thereafter, it flew regular passenger service linking little Friedrichshafen with Rio de Janeiro. Zeppelin became a name of world renown, and Friedrichshafen basked in its glory.

But the museum also recalls the reversals of fortune Friedrichshafen suffered before arriving at this happy occasion. The museum's center of attraction is a full-scale replica of a passenger section belonging to the *Graf's* larger descendant, LZ-129 *Hindenburg*. The silver-gray flank dwarfs the room like a dreadnought in drydock. Climb the boarding stairs and you enter LZ-129's spacious cabin, complete with cloth-walled sleeping compartments, cocktail lounge, and sightseeing windows. Within minutes you are transported back to 1936. The pianist is playing a Gershwin melody. You reach for a glass of champagne.... It's fabulous. And fabulously expensive. The *Hindenburg* section cost about \$4 million, which was





what it cost to build the original airship.

Albert Stoffler was amazed by the replica's verisimilitude. Stoffler had been a cook on the *Hindenburg* and was aboard on May 6, 1937, when the craft burned up over Lakehurst. (Mercifully, Count Zeppelin didn't live to see the horror; he died in 1917.)

"I jumped out feet first through a closed window and ran," said Stoffler. "I was very lucky. I never thought that it was dangerous to fly in a zeppelin, but after the crash I thought I will never fly again in an airship. I thought now everything is finished."

Stoffler wasn't the only one. Embarrassed by the disaster, envious of Eckener's fame, and angered by the anti-Nazi sentiments shared by the airshipmen, Air Minister Hermann Göring eventually ordered the demolition of the *Graf* and a successor ship and dispersed the crews. Then things got worse.

Zeppelin's gear-making subsidiary, ZF, its engine builder, Maybach-Motorenbau, and an aircraft company Zeppelin had founded with one of his young designers, Claude Dornier, all went into high production to feed Hitler's insatiable appetite for machines of war. By the outbreak of World War II Friedrichshafen had become a vital industrial center. And the Allies targeted it. A dozen raids by B-17 and Lancaster bombers in the spring and summer of 1944 virtually obliterated the city. Hundreds of residents were killed, the old town center was leveled, and the factories were ripped apart. When the occupying forces moved in, they found little more than rubble.

"My house was bombed to the cellar," Georg Hall remembered at the museum opening. "I don't have any mementos of my time in the air."

The production and advancement of airships—and the work of all the companies associated with them—had ceased.

In 1947 the Zeppelin Foundation's assets—the airship company, ZF, and Maybach—were transferred to the city of Friedrichshafen. The companies hadn't made an airship in over a decade, so the action seemed in keeping with the old graf's original charter. The transfer was largely symbolic, since Friedrichshafen's once-glorious industries were virtually dead.

*An artist's conception of the Zeppelin NT, which will fly this year, bears a predictable family resemblance to a 1930s color drawing of one of that era's great airships.*



But the count's tenacity seemed to sustain and permeate the place. Workers began to cart away the bricks and broken glass, straighten bent lathes, and bring motors back on line. Little by little, the factories came to life.

The factory yard at the Zeppelin works is chockablock with burnished aluminum sequoias: giant silos and tanks that the company now manufactures. The company also makes antennas, rocket components, and military vehicles, but its real success and second salvation began in 1954, when the Caterpillar company made Zeppelin its German agent. Today the former airship maker runs one of the highest-volume sales operations for construction machinery in the world.

ZF, meanwhile, has become one of the world's leading manufacturers of vehicular transmissions and steering systems. Its customers include Mercedes-Benz, Ford, Sikorsky, GM, Nissan, VW, Airbus,







Mercurier, and Porsche. Last year it posted sales approaching \$5 billion.

Although no longer part of the Zeppelin corporate family, Maybach-Motorenbau's successor, MTU, and Dornier are vibrant contributors to the area's economy. Today the majority of Friedrichshafen's 20,000 wage earners are employed by the descendants of the four original companies.

For most cities, that would be blessing enough. But thanks to that symbolic asset transfer fifty years ago, the city owns—that's right, owns—two of Germany's more successful international companies. The arrangement is unique in Germany, and probably most everywhere else in the world.

Today when a new D-9 'dozer goes to work on an autobahn interchange, when some plastic surgeon in Scarsdale buys a new Porsche Carrera, when an Airbus operator in Asia sends out for a flap actuator, cash registers ring in the Rathaus, Friedrichshafen's city hall. Through the foundation, Friedrichshafen owns outright or is partners in companies and properties throughout Europe, Asia, and North and South America. In an age when governments are cutting services to orphans, closing libraries, and dunning mercilessly for dimes, little Friedrichshafen is awash in beer barrelsful of money.

The foundation's charter says the money must be spent for the benefit of the people but cannot be spent on those things the city government should supply—schools, cops, garbage pickup, and the like. And so the mayor oversees two budgets, one for the city government and one for the foundation. And both for the commonweal.

The foundation's contribution varies from \$10 million to about \$16 million annually. It's paid for the construction and upkeep of a 480-bed hospital, a home for seniors, day

*The new Zeppelin Museum sits brightly at the edge of the Bodensee, the same lake where, in the first decade of this century, Ferdinand Graf von Zeppelin constructed his first airships (opposite, bottom). Easily the most embraced symbol in town, a zeppelin graces a small fountain (below).*



care centers, kindergartens, and ball fields galore. The foundation's most notable expenditure was construction of the Graf Zeppelin Haus. The sprawling cultural and convention center cost some \$35 million to build a decade ago, and the foundation spends another \$2 million annually to maintain the place and underwrite performances there. The city says the center is well worth the expense because every year it generates tens of millions of dollars' worth of business for the town.

Mayor Wiedmann, who by virtue of his political post is chairman of the boards of both Zeppelin and ZF, is one of the best paid politicians in the world, earning roughly \$200,000 a year, the same as the president of the United States. The citizens don't seem put off by that. They keep reelecting the gentleman, a charming fellow with a dazzling movie-star smile. The mayor's record is good—the city is clean, safe, and prosperous, the city-owned companies are going like gangbusters, and, most importantly, the foundation is reviving zeppelins.

After investigating the multi-floor museum, most of the opening-day visitors headed across town to gaze excitedly upon the skeleton of the NT taking form in a temporary hangar. The date for this public unveiling was preordained. Today was the anniversary of the first zeppelin's first flight. For most, it was a day of utter joy. The zeppelins were returning.

Herbert Guth, editor of Friedrichshafen's newspaper, *Südkurier*, remarked, "There's tremendous pride among the workers in their companies. Many families have several generations in the same company.

"There's a strong feeling because of tradition that they want [the NT] to be realized, but they also want it to be successful. I was a little bit reserved in the beginning, but the longer I heard about it the more convinced I became that this is viable."

A managing editor from the paper, Katarin Wahl, whose father worked at MTU and recently retired, said, "At the beginning many people said they're a little bit crazy for doing this again."

Commented Guth: "There's a strong parallel between what happened when the Graf Zeppelin had the idea of an airship and what's happening now. They laughed then and now, but now it's a reality."

This is Friedrichshafen's heritage. This is what carried it to glory, and what brought the Apocalypse to its front door. The night



before the museum opening, the mayor addressed a huge gathering of townsfolk in the Graf Zeppelin Haus. Beneath a black-and-white photo of the *Graf Zeppelin* projected high on the wall and with the sound of a children's chorus still filling the place, the mayor said, "Every citizen is affected by the presence of Zeppelin every day." When the mayor finished his address, the graf's great-grandson presented him a medal of honor from the Zeppelin family.

Bestowing the medal was one of the obligations that Albrecht Graf von Brandenstein-Zeppelin's name confers on him. He accepts them all with grace, including reciting the family history for magazine reporters and participating in the Second International Airship Conference, to which he now had to return. Our luncheon conversation had gone long. He had to hurry back for the afternoon's presentation.

I signed the luncheon bill and we moved outside. It was a glorious summer day. The air was soft, the temperature perfect.



*The lacy aluminum-alloy skeleton of the Zeppelin NT, under construction at Zeppelin Luftschiffbau, will account for only 12 percent of the airship's weight (right). From the cockpit instrument panel (above), the pilot commands the control surfaces on the craft's fins as well as the thrust vectoring system of its three piston engines.*

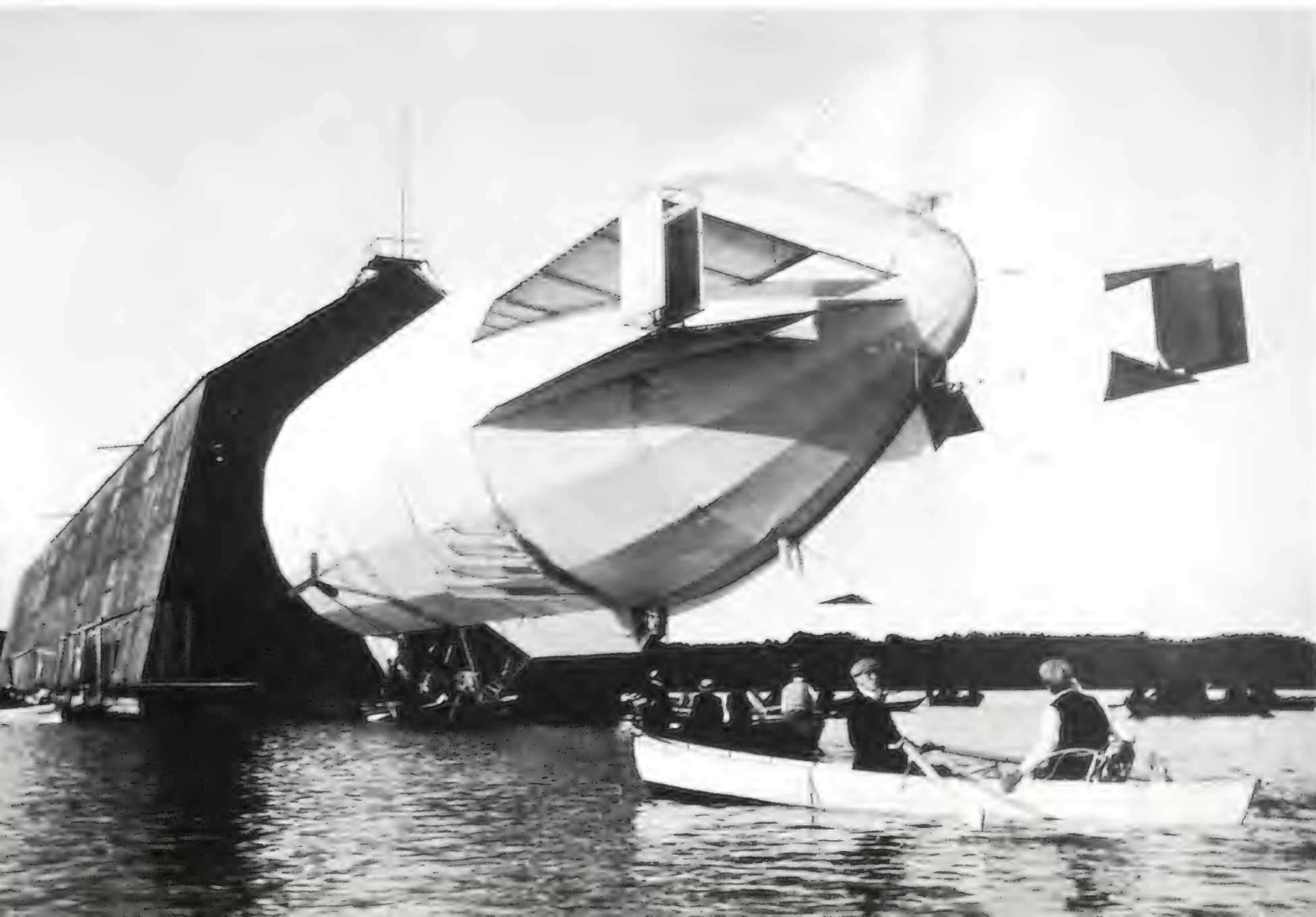


Sailboats rigged with bright, fat spinnakers were gliding across the lake. Pretty girls eating ice cream were strolling through the park. Overhead a half-dozen contrails crisscrossed, pointing everywhere.

Albrecht Graf von Brandenstein-Zeppelin drew in a deep breath. "Ah," he smiled, "it is a Zeppelin day."

Yes, as is every day here. ➔

NASM





by Bruce D. Berkowitz

*Illustrations by Paul DiMare*

**J**ust down the coast from California's Vandenberg Air Force Base and about 40 miles due west of Santa Barbara, there is a rocky jut of land called Point Conception. According to the local Chumash Indians, this is the embarking point for Similaqsa, the Land of the Dead Across the Sea. It is, in effect, the gateway to heaven.

According to Chumash legend, Point Conception was "humqag," a wild, stormy place where no one went. When a person died, his spirit would go to humqag to bathe and paint itself. Looking westward, the spirit would see a light and travel through the air to Similaqsa.

If only launches went this smoothly up the road, at Vandenberg's Space Launch Complex 6.

In its first 30 years of existence, "Slick Six," maybe the most deluxe spaceport ever built, never once sent a rocket into orbit. Over that period the Air Force, NASA, and several aerospace companies spent about \$10 billion building, demolishing, rebuilding, modifying, and maintaining the facility. It seemed as though the spirits across the way in Similaqsa, not wishing to be disturbed, had decreed that Slick Six would be always ready but never used.

This winter SLC-6 is getting another chance to shake off its curse. Lockheed Martin is preparing to launch an Earth observation satellite for NASA. If the company succeeds, the Lewis spacecraft (of Lewis and Clark) will be the first payload to leave this pad and get to orbit. The launch pad's new owners hope that a successful launch may start to turn things around, and they're making big plans to stir the old spaceport back to life.

Again.

Slick Six looms through the fog at Vandenberg like a castle on the shore, its 27-story Mobile Service Tower the tallest among several giant structures. SLC-6 started life as a Titan launch pad, with construction beginning in 1966. The Space Age was in full swing, and the Air Force, seeking a role for itself in space, planned to send "blue-suit" astronauts into orbit for reconnaissance and scientific missions. The vehicle was

Vandenberg's Space Launch Complex 6  
has seen more looks than Madonna.  
What it needs now are a few hits.



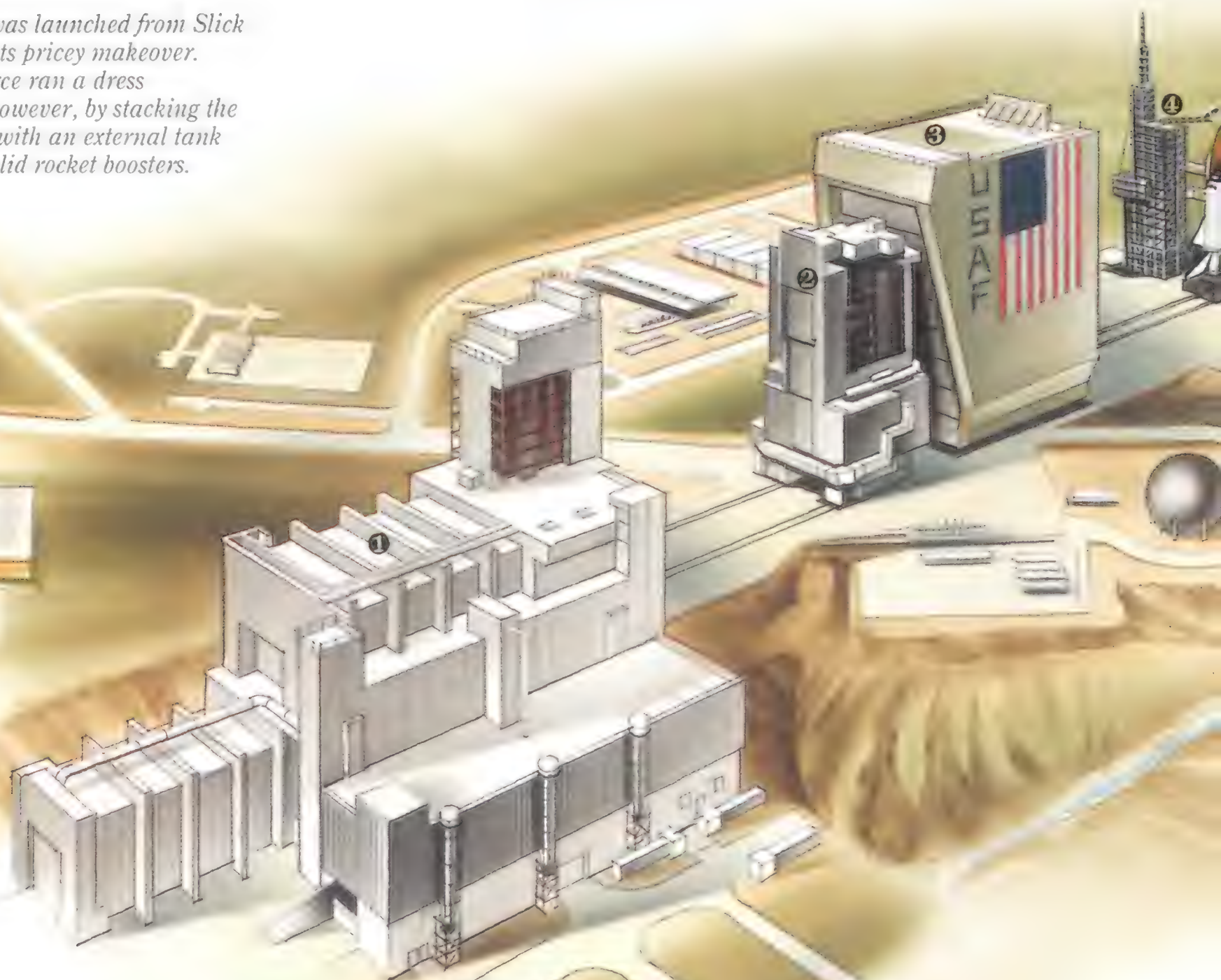


# The Nine Lives of Slick Six





*No shuttle was launched from Slick Six despite its pricey makeover. The Air Force ran a dress rehearsal, however, by stacking the Enterprise with an external tank and inert solid rocket boosters.*



to be the Manned Orbiting Laboratory (MOL), a can-shaped space station about the size of an Airstream travel trailer. The plan was to launch MOL from Slick Six on a Titan launch vehicle, with a modified Gemini capsule on top for ferrying the astronauts to and from orbit.

In its first incarnation, Slick Six looked a lot like SLC-4E and SLC-4W, the Titan complexes nearby: pad, exhaust duct, umbilical tower to provide fluid and electrical connections to the vehicle before launch, and the massive service tower mounted on rails. Preparing a Titan for launch is essentially a large construction project. Each component of the rocket—tanks, solid rocket segments, payload—is hauled to the site by truck. After a crane in the service tower raises the pieces into position, technicians bolt them together, mate the plumbing and electrical connec-

tions, and check out the systems to see that everything works. Then they roll back the service tower and clear the area. About 93 percent of the time (the Titan's reliability is about average for expendable launch vehicles), the satellite disappears over the southern horizon and reappears from the north 90 minutes later, traveling in polar orbit around Earth.

The ability to reach polar orbits is what made—and still makes—Vandenberg so attractive. Many spy satellites, some weather satellites, and most remote sensing satellites require a north-south orbit so that, as Earth rotates underneath, every point passes under the spacecraft. In the earliest days of the base, the CIA's CORONA imaging satellites were launched from the north end of Vandenberg on Thor boosters. Later, as satellites grew in size, the Air

Force built bigger rockets and new pads from which to launch them, moving south along the coast.

Not that Vandenberg is a perfect place for a launch base. Unlike Florida, the terrain is rugged and mountainous, the San Andreas fault and its cousins are nearby, and the winds along the California coast are strong and unpredictable. But it's the only good alternative. In 1960, the United States tried to launch a near-polar shot from Cape Canaveral. The rocket and the destruct system both failed, and the vehicle landed on a farm in Cuba, killing a cow. Three hundred students, several cows, and a bull marched in protest in front of the U.S. embassy in Cuba. U.S. officials vowed never to repeat the experience. Look at a map; the only cow-free azimuth extending from the continental United States to polar orbit is from the





- ① Payload Preparation Room
- ② Payload Changeout Room
- ③ Shuttle Assembly Building
- ④ Access Tower
- ⑤ Mobile Service Tower

corner of California now home to Vandenberg Air Force Base.

So when the Air Force wanted to fly astronauts in polar orbit, it decided to build Slick Six. But in 1969, with construction just about finished, the Department of Defense canceled MOL, arguing that there was nothing people could do in space that machines couldn't do better. It was cheaper to finish the work than pay cancellation penalties to the contractors, so by 1970 the Air Force had a complete, functional launch pad, which it promptly abandoned. By that time the government had spent \$3 billion building Slick Six.

Don Smith, an engineer working on MOL at the time, recalls how the program stopped dead in its tracks. "It was a sledgehammer blow to the community," he says. "You could pick up a house for just the cost of the payments."

Slick Six sat undisturbed for almost a decade. Meanwhile, the other pads at Vandenberg continued to launch about a dozen missions each year. The abandoned complex might have remained a rusting monument to early-1960s space enthusiasm had it not been for the space shuttle. President Nixon ordered all government agencies to phase out expendable boosters and instead put their payloads on the new Space Transportation System. NASA planned to build its Florida shuttle facilities by converting two Saturn V pads left over from the Apollo program. It seemed reasonable for the Air Force to do the same thing with its never-used Titan pad at Vandenberg (see "Spaceport West," Apr./May 1986).

According to a task force commissioned by the Air Force in 1974, the government stood to save \$100 million by modifying Slick Six rather than starting from scratch. So in 1979 workmen began dismantling the old complex and converting it to a shuttle launch port.

The Air Force knew it would have to do things differently from NASA. At Cape Canaveral the shuttle orbiter, external tank, and solid rocket boosters are mated in a huge Vehicle Assembly Building inherited from the Apollo days, then transported on a tracked crawler (also left over from Apollo) to the launch pad three miles away. Moving a fully assembled space transportation system around in the flatlands of Florida is one thing; moving it over hilly Californian terrain was out of the question. The Air Force alternative was to assemble the vehicle the same way it prepares expendable rockets: on the pad.

Barring bad weather, the shuttle would land at the Vandenberg runway, which had to be nearly doubled in length to 15,000 feet. From there it would be taken to a newly built Orbiter Maintenance and Checkout Facility for refurbishment. Then it would travel prone on a specially designed 76-wheel transporter some 17 miles over existing base and public roadways to Slick Six. To accommodate the spaceplane, the roads along part of the route had to be widened, and notches had to be cut in the hillsides to provide enough clearance for the orbiter's wings.

Meanwhile, the launch crew would already have stacked the two solid rock-

et boosters and joined them to the external tank using the Mobile Service Tower—the modified Titan tower. When the orbiter arrived at Slick Six, it would be moved inside a newly built Shuttle Assembly Building, rolled up to the launch stand, and hauled into an upright position by the service tower so it could be attached to the external tank.

With the whole shuttle "stack" assembled, the payload for the mission would be moved from a newly built Payload Preparation Room at the west end of the complex to the pad, using the (also new) Payload Changeout Room. The changeout room, which would weigh 3,100 tons, was, in effect, a shuttle from the clean room inside the Payload Preparation Room to the clean room in the Shuttle Assembly Building. Like the service tower and the assembly building, it rolled along tracks, like movable bookshelves in a library.

The plan looked great on paper, but in practice it proved difficult and expensive. The new payload processing facility, for example, had to be blast-hardened to protect the multi-million-dollar spacecraft inside in case a shuttle exploded. The three moving buildings had to fit together as precisely as a wooden puzzle, including all the connections for power, propellants, and data transfer. Since many satellites require an ultra-clean environment, the seals between the buildings had to be airtight. And because many of the polar-orbiting shuttle payloads would be military and intelligence satellites, the facilities needed electronic shielding so that Soviet surveillance ships moored offshore would not be able to snoop.

Anyone who has tried to remodel an old house is familiar with the money pit in which the Air Force soon found itself. Everything cost more and took longer than planned. For starters, no one had complete plans for the existing pad; when MOL was canceled, the money to store documents had disappeared too. When the crews began hammering into concrete, they found pipes, cables, and metal structures no one knew existed. Even the weather seemed to plot against the project; the Shuttle Assembly Building is essentially a \$50 million wind break, added in 1981 when the designers realized their original plan to assemble the shuttle outdoors





\* Refurbished Minuteman Missile

\*\* Multiservice Launch System Small Launch Vehicle (commercial Minuteman)

\*\*\* Lockheed Martin Launch Vehicle

Only the Taurus and the Delta have so far launched commercial payloads to orbit.

wouldn't work in that climate. The price tag for the modifications began to grow. By 1981 it was exceeding even the Air Force's outside estimates. Eventually the shuttle program at Vandenberg—Slick Six mods and associated costs—maxed out at about \$4 billion.

Earl Severo, a colonel assigned to the Air Force shuttle office in Houston, was called to California to oversee completion of the construction job. Today Severo talks about those days with a kind of resigned amazement, like an engineer who has seen every problem imaginable and lived to tell the story. Take the Great Hydrogen Entrapment Scare, for example. Some NASA technicians had hypothesized that hydrogen venting from the shuttle's engine might collect underneath the pad in the exhaust ducts. "They had these models, you see, that showed how all these little hydrogen bubbles might collect into one gigantic bubble, so that if a launch was scrubbed, the entire shuttle might blow up." He rolls his eyes, knowing that he never could have won an argument with a computer model. The Air Force resolved the issue by installing a sparkler system to burn away any hydrogen in the ducts just before ignition. In the end, Severo did indeed fix all the problems, and the pad was ready for its first launch, scheduled for July 1986.

Unfortunately, it never got the chance. *Challenger* exploded that January and the shuttle was grounded for more than

two years. The Air Force, always reluctant to fly on the shuttle, gladly went back to its less costly Titans. Indeed, when the shuttle program had run into delays in the mid-1980s, the Air Force had begun buying Titans as a way to keep its options open. When the shuttle was grounded, the Air Force had the justification it needed to bail out of the shuttle program completely.

So instead of launching shuttles, Severo turned to a new task: shutting down Slick Six again. Over the next two years the Air Force wound down operations and laid off workers—1,700 in the first five months, from a peak force of about 5,000. At least those who remained had steady work. "Just the logistics of making sure everything is catalogued so that someone doesn't open up a surplus store in Santa Maria is awesome," Severo says.

His reward for a job well done was to be put in charge of all Vandenberg launch operations. He arrived at his new position, director of the Western Space and Missile Center, on April 18, 1986. On that same day, an Air Force Titan 34D launched from SLC-4E exploded just eight seconds into flight, disappearing so fast that even high-speed cameras hardly caught the falling ball of flame. "Great timing," says Severo.

The total repair bill was \$50 million, and Air Force officials counted themselves lucky. If the rocket had let go just four seconds earlier, they would have lost the only pad in the world ca-

*Spaceport Systems International targeted the small end of the launcher industry for its new spaceport.*

pable of launching large Titans (and their intelligence payloads) into polar orbit. Between rocket failures and the shuttle groundings, U.S. satellite reconnaissance was being stretched to the limit. The last thing the Air Force needed was to lose the ability to launch a Titan because it didn't have a working pad. The Air Force proposed building a new pad, SLC-7; Congress told it to refurbish a Titan pad it already owned—the one underneath the shuttle launch complex at Slick Six.

Returning Slick Six to its prior state and updating it to operate the latest version of the Titan would have cost another \$700 million. The Air Force let out contracts and was \$100 million into the job when the Berlin Wall and the Warsaw Pact collapsed, along with much of the U.S. public's support for military spending. What had been considered in the cold war "redundancy of essential systems" was now considered wasteful duplication. The project was canceled before it even made it off the drawing board.

Ironically, the end of the cold war may have ended Slick Six's rebirth as a Titan pad, but it also created new opportunities. Military contractors were scrambling for new business. One, Lockheed, thought it might use its missile know-how to capture part of the market for launching small satellites, a business that looked especially promising in the early 1990s. The brass ring was a contract to launch proposed low-Earth-orbit communication systems such as Iridium and Globalstar, which would require dozens of satellites in polar orbit. Most market analysts thought that companies would launch their initial constellations in clusters on top of large boosters. But small boosters would still be needed to replace the satellites as they wore out, one by one.

Lockheed put Ernest Bedegrew in charge of finding a polar launch site at Vandenberg. A 30-year Lockheed veteran, Bedegrew toured the base in March 1992 to scout out candidates and quickly settled on Slick Six. "There it was, sitting big as ever, with no one us-



ing it," he recalls. "They considered it a rust bucket, a museum piece." Bedegrew, though, saw it as the cheapest, fastest way to build a launch pad for his company's new Lockheed Launch Vehicle, or LLV.

One of Slick Six's attractions was that it already had passed an environmental impact review—no small consideration in Santa Barbara County, home to some of the stiffest environmental regulations in the world. The Air Force had already figured out how not to disturb the unarmored three-spine stickleback and to monitor the rocks offshore to make sure the rockets didn't disturb mating seals. In fact, it's hard to find many local environmentalists who object to the base. They reason that as long as the Air Force is there, no one else is.

The main question for Lockheed was whether the pad still worked. "The gantry had been sitting so long there were actually indentations in the rails," says Bedegrew. After proving that they could move the tower, Lockheed built a footstool-like mount for the LLV over an exhaust vent that one of the shuttle's solid rocket motors would have used. With a few months of sandblasting, painting, and welding, the company (by then Lockheed Martin) tried its first launch on August 15, 1995. After 30 years, a rocket finally lifted off from Slick Six.

It failed 80 seconds into flight.

Meanwhile, Earl Severo was looking for a new project. He had retired as Van-

denberg director in the fall of 1991; "My goal was to be the Best Rested Man in America," he recalls. Severo started on a bicycle trip across the United States. He got as far as Utah when he began to reconsider. "I had retired for 60 days and could see that this 'Best Rested Man' concept wasn't going to work. I always wanted to get into corporate America. The problem was, my only expertise was in space launch."

At Vandenberg, Severo had had a lot of time to think about how the Air Force launched rockets and whether there might be a better way. He began reading about Total Quality Management and streamlining organizations. He thought he had a better idea: a pad that fit different sizes of launch vehicles, and a support organization that provided total service—bring your booster and he would take care of the rest.

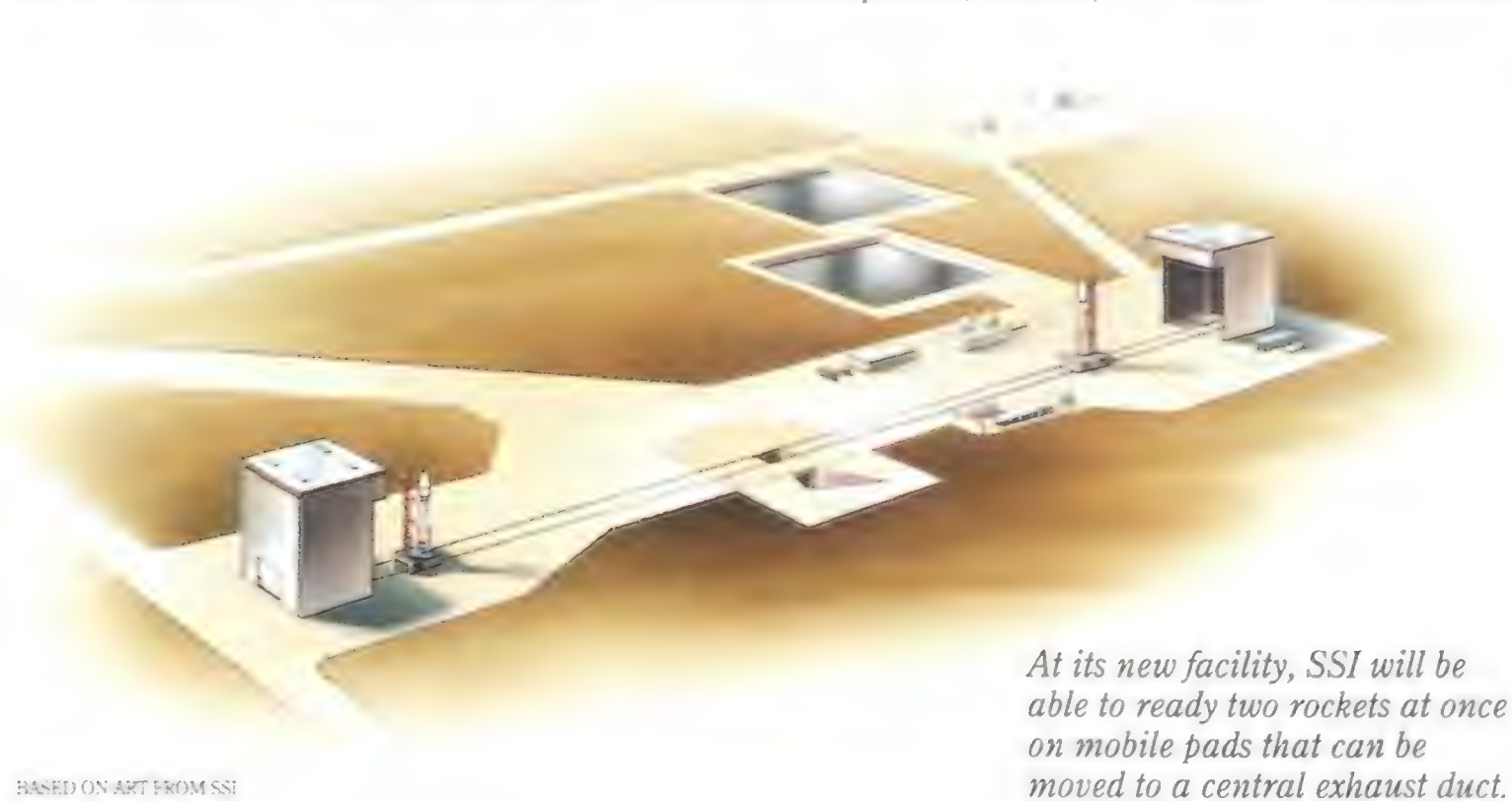
A friend suggested he speak to Don Smith, who had been lobbying for the state of California to promote a commercial launch site at Vandenberg. Smith and Severo hit it off and established California Commercial Spaceport, Inc. in 1993. With the help of an Air Force grant and accommodations in state law, the venture was off. One year later, CCSI formed a limited partnership with a corporate heavyweight, ITT. The partnership—Spaceport Systems International—was formed to raise money for launch accommodations. Paul Maye, the company's senior director for strategic planning and business development, recalls, "ITT was

buying the New York Knicks, the Rangers, and Madison Square Garden, so we knew they could kick in a mere \$50 million for a spaceport."

SSI planned to build a totally new, ultra-efficient pad at Cypress Ridge, a site at the south end of Vandenberg. The local environmentalists protested; Cypress Ridge was undisturbed land. They wanted California Spaceport to go someplace that had already been dug up and paved over. In short, they wanted Severo to go back to Slick Six. "We thought, *Please don't throw me in that briar patch*," Severo grins.

But that's exactly where he is today. The new, privately funded pad, which SSI wants to use for a range of small to medium vehicles, is being built in the parking lot just outside the fence. It's safer that way: The Air Force still owns Slick Six and could take it over again for its own operations. Smart people don't invest \$50 million in something that could be yanked out from under them at any time. The company is already using Slick Six's old shuttle payload processing facility, however. SSI has an agreement to launch refurbished Minuteman missiles for the Air Force beginning late next year, when the east end of the new pad should be finished. Severo hopes commercial contracts will follow. All this suits the Air Force fine; any private facilities that SSI builds at Vandenberg mean less money the government needs to invest.

Lockheed Martin, meanwhile, has its own backlog of vehicles (re-christened LMLVs) waiting to be launched from Slick Six's existing pad. And, even if the two ventures run into snags, there's always the next-generation large Air Force booster, called the Evolved Expendable Launch Vehicle. At least one of the companies vying to win this plum contract proposes to build the EELV launch pad using "existing assets"—Slick Six. They say they can save money by making some limited modifications to the pad. ➤



*At its new facility, SSI will be able to ready two rockets at once on mobile pads that can be moved to a central exhaust duct.*

BASED ON ART FROM SSI



# One Good Year

That's all the Boeing 247 ever got—until a group of airplane lovers decided that wasn't enough.

by Tom Huntington

Photographs by Chad Slattery

Stepping through the oval-shaped doorway into the cabin of the Boeing 247 is like stepping into a time machine. Outside, it's 1996 and some of the volunteers who restored the vintage aircraft for Seattle's Museum of Flight are telling their stories. But inside, it's 1933 and you're looking down the aisle of the world's most modern airliner.

When United Air Lines started flying Boeing 247s on transcontinental routes in 1933, the new airliners were an instant hit. And no wonder. Up to then, the airliner of choice had been

the Ford Tri-Motor. With a cruise speed of only 100 mph, the Tri-Motor subjected its transcontinental passengers to long hours of deafening noise, not to mention constant vibration produced by its three engines. The Tri-Motor's

thinly padded seats and poorly insulated cabin made air travel more of an endurance marathon than a pleasure trip.

Boeing's new airliner changed all that. Its cabin was soundproofed and







*Only one Boeing 247 still flies. The first modern airliner blazed the trail for the DC-3, then disappeared. After its first restoration, the 247 flew over its hometown, Renton, Washington, in 1966 (inset).*



MUSEUM OF FLIGHT





*In the 1930s, flying still had some romance, especially aboard the luxurious 247. Luxury takes time to restore; one volunteer spent three years building replicas of the 10 seats (below).*

could be air-conditioned or heated. Though by no means spacious, the 247 had room for a lavatory and 10 generously padded seats. Each seat had its

own reading light and air vent.

The 247 was modern inside and out. A low-wing, all-metal monoplane with retractable landing gear, it had a sleek, sporty profile far more streamlined than that of the boxy Ford. Powered by twin Pratt & Whitney Wasp engines, it cruised 50 percent faster than the competition. "In the matter of speed, the transports of yesterday averaging 100 miles per hour are now obsolete," pronounced



the *New York Herald-Tribune* in 1933.

But in 1934 Donald Douglas introduced the bigger and faster DC-2, and suddenly the Boeing 247 had become the transport of yesterday.

Of the seventy-five 247s built, only four remain, and only one of those, the 247-D owned by the Museum of Flight, is still flying. Based at the museum's restoration facility in Everett, Washington, the 247-D, number 13347, underwent a 14-year restoration by Museum of Flight employees and volunteers working for the Boeing Management Association. Two years ago it made its first post-restoration flight.

"Basically, our rule is not to fly our airplanes," says Museum of Flight curator Dennis Parks. But the museum made an exception for the 247 "because of the tremendous amount of interest from a lot of the old-timers—former Boeing employees who worked on the restoration." Still, it was not an easy decision for museum staffers, who heatedly debated whether the benefits of flying a vintage airplane outweighed the risk of harming it. They decided on a modest number of outings—the occasional airshow or museum dedication—and Parks defends the flights by pointing out that the 247 can fly very well on one engine and that only Boeing test pilots are checked out to fly it. Besides, they figured it would be a shame not to fly the old airplane after the long road it had traveled back to respectability.

Many airliners of a certain age have had a checkered career, and N13347 is no exception. Like a one-time movie star forced to take ever-diminishing roles to survive, N13347 went from assignments with main-line carriers to flying for increasingly obscure outfits. It was delivered to Pacific Air Transport in 1933 and later flew for the newly formed United Air Lines before being sold to Pennsylvania Central Airlines. During World War II, the airplane served with the Royal Canadian Air Force. After the war it flew for two small carriers, then headed south for a stint with a Costa Rican airline. In 1954 it returned to the United States, flying as a crop-duster and, finally, a firefighter and cloud seeder. Following a landing accident in 1961, the aircraft was retired at an airport in Taft, California, where



*The restorers searched diligently to find replacement parts for the cockpit's instrument panel (right).*

*The 247's caretakers run up the rebuilt Pratt & Whitney engines about once a month (below).*

it seemed as if it would be grounded forever.

Five years later, Jack Leffler, a captain for United Airlines, noticed the airplane sitting derelict and decided to rescue it. Leffler was a member of the Pacific Northwest Aviation Historical Foundation, the predecessor to the Museum of Flight. Leffler and another PNAHF member, Ray Pepka, dug into their own pockets to come up with the \$10,000 necessary to buy the airplane.

Before they could fly it home, however, they had to tune up both engines and replace electrical and magneto parts. When the aging airliner was ready, Leffler and Pepka, flying as copilot, began

a cautious journey back to Renton, just south of Seattle. They made frequent stops: Fresno, Red Bluff, Medford, Eugene, Portland, and Auburn.

They flew the entire route without raising the landing gear, which hadn't been cycled in six years. "It's heavy on the controls," said Leffler, who died in 1990. "There is no boost. It's a manual-control airplane; it's not like the DC-3—Lord no. You put an aileron down and you wait for the response. You kick it to see if it's alive."

The 247 landed in Renton on March 2, 1966, and members of PNAHF set about getting the airplane ready to fly for a local airshow on June 15. In addition to mal-

functioning landing gear and brakes, the 247 had a lot of corrosion. "You could stick your pencil right through the paint and there was no steel behind it on the wing-spar caps," says Victor Seely, a retired Museum of Flight curator who helped with the restoration.

A landing accident in Costa Rica had damaged N13347's nose, and the re-







storers had to replace it with the nose of another 247. They then decided to paint the airplane in United Air Lines livery from 1933, which meant stripping off seven layers of paint. "Most of the money came out of our own pockets as volunteers," says Seely. "The annual [PNAHF] budget back in 1966 was something on the order of \$500. That didn't go far. The bill for the paint remover alone was \$330. The company sent us the bill, then said 'Forget it.'"

By now, with the deadline for the June airshow drawing near, PNAHF volunteers rushed to finish the paint removal at Renton Airport, where they received free water and electricity. With scraps of old paint blowing all over the runway, the volunteers worked through the night for two days to apply the new livery. The 247 was ready for the airshow—but barely. "We flew it while the paint was still tacky," says Seely.

N13347 continued to fly in airshows until it was grounded for repairs in 1976. By the time the Museum of Flight began a second restoration four years later, the 247 was in the worst shape of its life. The airplane lay disassembled

at Paine Field in Everett, Washington; corrosion had returned and birds and mice had built nests in the wings and tail. Making it airworthy would require a virtual remanufacturing.

None of the original interior remained, and leaking tanks of chemicals from the airplane's cropdusting and fire-fighting days had wreaked havoc with the aluminum skin. Fortunately, plenty of people were eager to help bring N13347 back to life. "There's never enough of these real interesting, unique airplanes to go around," says Seely.

Most of the skin could be salvaged, but first the corrosion had to be smoothed away. The remaining 30 percent of skin had to be replaced, and the BMA volunteers faced the difficult task of shaping the sheet metal into complex curves without the original hydroform tooling.

The complete overhaul necessary for the two Wasp engines was farmed out to a contractor, but many smaller parts would have to be replaced—if duplicates could be found. "We put in a mighty effort to find replacement parts," says Bob Hood, who is now working on a restoration of the Museum of Flight's

*In 1933 United Air Lines transported passengers and mail (above) in unpainted 247s finished only with anodized aluminum. The anodized finish saved weight, but its uneven color gave the airplanes a patched-together appearance that alarmed travelers. United's livery in the 1940s was blue trim on a white background (opposite, above).*

de Havilland Comet. "We had people looking all over the world. I drove up to Connecticut looking for a fuel gauge that had been left under a tree. Unfortunately, it had been under that tree for about 20 years. There wasn't much left."

When it came time to reassemble the refurbished airframe, the volunteers had microfiche of engineering drawings to guide them. But for the airliner's interior, the only documentation they had were a few early publicity photos. Re-creating the padded passenger seats was particularly troublesome; luckily, the volunteers tracked down an original wool-upholstered, horsehair-stuffed seat that had been stored at a United





been here ever since."

One of the final acts of the restoration was repainting the 247, this time in United Air Lines livery from the 1940s. The work was done by Boeing employees at a nearby production facility (where the new Boeing 777 is being built). After the paint had dried, a group of volunteers insisted on painting "Capt' George Juneau" on the nose of the 247. Juneau, a retired pilot and volunteer for the Boeing Management Association, had spearheaded the restoration, routinely putting in 16-hour days. In 1991, a health problem forced him to retire from the project, though his interest in the airliner continues. "He even let the maintenance on his house go to pot in favor of the airplane," says another volunteer. "You can't beat people like that."

In keeping with the era of the livery, vintage newsmagazines are now stored in the racks on the forward bulkhead. "Planes cost money—a lot of money," says FDR in the quote on the cover of the June 10, 1940 issue of *Time*. (The unit cost for each 247 was about \$68,000.)

On June 24, 1994, N13347 was finally ready to fly. With Boeing test pilot

Richard "Buzz" Nelson at the controls, the airplane took off from Paine Field. "I love to fly it," says Nelson. "It's a very honest airplane." Nelson, who is Boeing's lead pilot for 767s, also finds the airliner a little...slow. "We can get 140 [mph] indicated if we rock it," he says. "It's really slow. It has a really nose-down attitude too. It looks like it's going downhill all the time."

A group of about 35 of the volunteers watched the takeoff. "The airport people wouldn't let us get right up next to the runway," says Bob Hood. "But we were there with all manner of cameras and recorders. There was more than one tear in the eye."

Though Boeing takes pride in its latest contributions to the 247, the company helped set the scene for the airplane's eclipse some 60 years ago. In 1933 Boeing was part of a large hold-

*The man who supervised the 14-year restoration, retired pilot George Juneau, was honored with a permanent expression of gratitude (below).*

warehouse since 1934. "Now we had one fellow who worked for about three years on the 10 seats for the interior of the airplane," says Hood. "He has a farm, and he was very busy. But he did an absolutely superb job—the seats are beautiful. And when he was done with the seats, he was done with the program. I remember he brought them out in his car one night. I helped him unload them, and I knew we were not going to see him again."

Other volunteers, like Joe Polocz, couldn't tear themselves away. "I came out to the airport and saw this airplane in pieces," says Polocz, who was instrumental in fabricating engine cowlings (the originals were missing). "I've







GORDON S. WILLIAMS COLLECTION

*The once-modern NC13347 had its heyday some 60 years ago (above, at an airport in Salt Lake City). At its new home in Seattle, Boeing test pilot Buzz Nelson (far right), one of the few people authorized to fly the vintage airplane, gives George Juneau a ride.*

*Opposite: It's hard to believe these two are related, but the 777 is the latest in Boeing's line of dual-engine, all-metal airliners, which began with the 247.*

ing company, the United Aircraft and Transport Corporation, which included Pratt & Whitney, several airlines, and propeller manufacturer Hamilton Standard. Boeing had promised the first sixty 247s to the airlines in its United family. So when Jack Frye of rival TWA came calling, he was told he would have to wait. Instead, he turned to Donald Douglas and designer Jack Northrop, who set to work on the hugely successful DC series of airliners.

Boeing did attempt to match the DC-2, producing the 247-D, an improved version with variable-pitch propellers, more powerful engines, and a redesigned tail. With these modifications, the D



models could reach 200 mph and cruise at 189. Most of the first 247s, including N13347, were converted to Ds. But it wasn't enough.

TWA had unseated United as the king of transcontinental routes, and to keep up with the competition, United

began farming out its 247s to various feeder airlines. Eventually United purchased its own DC-3s, and suddenly, the 247's reign was over. Now only N13347 continues to fly, the steady roar of its Wasp engines a reminder of its one year of glory. ✈









## >SIGHTINGS<

When Fighter Squadron VF-24, the Fighting Renegades, was retired last June, photographer Chad Slattery was on hand to document the somber ceremony. VF-24 was commissioned in 1955 and initially flew North American FJ-3 Furies at Naval Air Station Moffett Field in California. The squadron's last airplane was the Grumman F-14A.

Slattery cited Edward Steichen's wartime photography as inspiration. "He worked at the intersection of men and planes," says Slattery. "It's a hard zone to photograph and he did it so well. I decided to make some portraits as homage to him. I asked [the subjects] to pose by the area of the plane they knew best."

When a Navy squadron is disassembled, its aircraft and people (VF-24 comprised 33 officers, 220 troops, and nine aircraft) are absorbed by other squadrons. One-third of the Fighting Renegades moved down the hall to squadron VF-211. Others went to Naval Air Station Oceana in Virginia Beach, and some, at the end of a three-year sea tour, went to

GEORGE HALL/CHECK SIX











shore tours at places like the Pentagon.

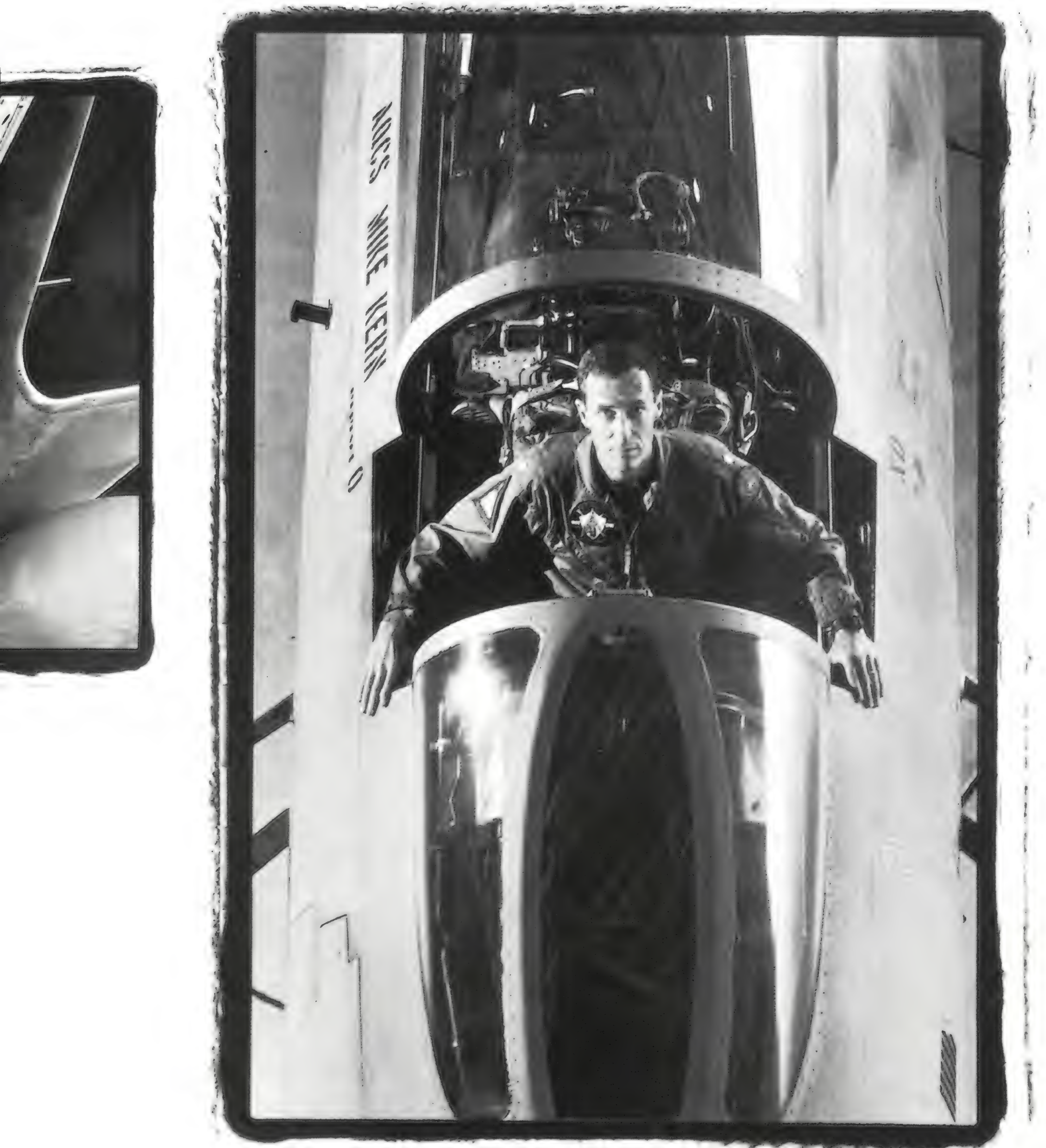
"When this squadron goes away, we'll feel that something valuable is being taken away from us," Lieutenant Junior Grade Brian "BB" Burns (below) said before the ceremony. "It's like somebody tearing down your old high school." Burns moved to helicopter/anti-submarine squadron 45, based at Naval Air Station North Island in San Diego.

Petty Officer Tim Haman (above), named Sailor of the Year for 1996, joined VF-211. Commander William R. Massey Jr. (opposite) went to Fighter Squadron 101, Naval Air Station Oceana. Petty Officer First Class Peter J. Seifried (now Chief Aviation Ordnanceman; above right) moved to Naval Recruiting Station, St. Peters, Missouri.

"I was assigned to photograph the rituals of a disestablishment and look for emotional moments, but there really weren't any," Slattery says. "Everyone had been in at least a couple of squadrons and knew they'd serve in others before their careers ended. Their loyalty was to the machines."









# Single-Minded

**Halfway to Anywhere** by G. Harry Stine.  
M. Evans, 1996. 320 pp. \$21.95  
(paperback).

In his first book, *Earth Satellites and the Race for Space Superiority*, G. Harry Stine explained the effects of launching the world's first satellite into orbit: One superpower gains international prestige while the other is forced to respond. Payloads lofted into orbit by each country become progressively larger and more complicated, and quickly the vast realm of space is opened to human exploration. The United States and the Soviet Union must decide what they will do in this new environment to show the world which system of government is superior. It may sound like a history book, but *Earth Satellites* was actually published a few months before the Soviet Union launched the world's first satellite, Sputnik 1.

Now, nearly four decades later, Stine tells how spaceflight is being reinvented by the introduction of the world's first completely reusable single-stage-to-orbit (SSTO) spacecraft, the McDonnell Douglas DC-X (see "Single Stage to ...Where?," Feb./Mar. 1994). *Halfway to Anywhere* begins with an account of the DC-X's historic second flight on September 11, 1993. Stine makes both the launch and the spacecraft seem simple—which they were. In fact, the DC-X was pieced together from off-the-shelf technology, including engines from the Centaur, navigation systems from the F-15 Eagle, and hinges and hatch-closing springs from K-Mart and Home Depot.

But the SSTO concept isn't new, and Stine traces the history of both the concept and the promise, pointing out that the space shuttle, our first attempt to create a vehicle that would make space

travel affordable and easy, was never able to live up to that lofty goal. The SSTO spacecraft began as science fiction in Jules Verne's *From the Earth to the Moon*. By the time Americans were ready to start a moon program, they felt an urgent need to beat the Soviets, so instead of developing an SSTO craft, they employed existing artillery technology. Stine reports that in the late 1960s, aerospace engineer Phil Bono made the first proposal for a practical SSTO craft, but the concept was reborn over a dozen times in subsequent decades, only to die for lack of support.

Through the efforts of the Citizens' Advisory Council on National Space Policy, the dream has been realized. As an insider, Stine explains in detail the history and logic behind this informal council's decision to support development of an SSTO. However, Stine is unclear as to why former Vice President Dan Quayle bought the council's recommendation, even though the author details the government's efforts to stop entrepreneur Gary Hudson's effort in a similar project, the Percheron, only a few years earlier.

In places, *Halfway to Anywhere* reads like a spy novel. Stine offers some interesting insights about the efforts of Lockheed (now Lockheed Martin) to develop its own SSTO craft, the X-33 (left). However, the most intriguing aspect of the book is his description of the impact of future SSTOs. Stine predicts that in perhaps ten years it will be possible to send a package anywhere in the world in less than an hour. A person living in Los Angeles could fly to Europe in about 30 minutes. And everyone will be able to get to low Earth orbit, which, as author Robert A. Heinlein put it, is "halfway to anywhere." Stine's latest book is written with the same spirit as his first. I recommend it for anyone interested in peering into the future.

—Bob Craddock, a planetary geologist at the National Air and Space Museum's Center for Earth and Planetary Studies, has a deep interest in space travel.



LOCKHEED MARTIN (X-33)



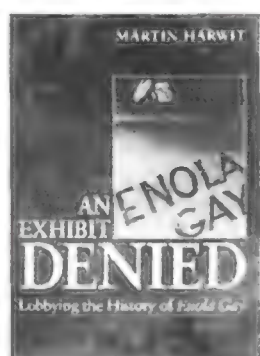
**An Exhibit Denied** by Martin Harwit. Springer-Verlag, 1996. 456 pp., illustrations. \$27.50 (hardcover).

Forty-eight hours before he took off on a flight to Hiroshima, Lieutenant Colonel Paul Tibbets roamed around the U.S. air base on Tinian Island looking for someone who could paint a sign. He found his man and asked a favor: Would he paint a name under the window of the B-29 Stratofortress Tibbets was about to pilot on a special bombing run? The painter brushed in the maiden name of Tibbets' mother, Enola Gay. For Tibbets, the name had a magical, protective power. Half a century after receiving its new name, aircraft number 82 of the 509th Composite Group has become a powerful talisman itself—representing death and destruction, service to country, the triumph of technology, and peace.

In 1949 the Air Force turned the *Enola Gay* over to the Smithsonian, and when the National Air and Space Museum opened its doors in 1976, it took possession of the airplane. For many years the old bomber sat in storage, slowly deteriorating. Efforts to restore it and create an exhibit began in the late 1980s, and this is where the author, former NASM director Martin Harwit, picks up the story with his first-person narrative.

Harwit's narrative is compelling and disturbing. He charges that the Smithsonian's leaders "gave in" to

pressure from the Air Force Association and its allies in Congress, who sought to kill NASM's plan to exhibit the *Enola Gay*. Harwit is a biased reporter, of course. He became director of the Museum in 1987 and served until 1995, when he was forced



to resign during what he calls "a public brawl" over the exhibit. He tries to balance his account by including letters and memos written by others. The result is a restrained analysis with a bitter message.

According to Harwit, the first part of the two-stage assault on the exhibit came from a small but aggressive lobby of retired Air Force officers. They had been pushing for an *Enola Gay* display for years and were not interested in learning about historical context, he says. They were also emphatically opposed to including objects and photos evoking the suffering of Japanese civilians, such as a Hiroshima schoolgirl's charred lunchbox.

What many veterans wanted, according to Harwit, was a shiny memorial to victory—nothing more. Many of the documents Harwit cites display this chauvinism, such as a 1992 letter from W. Burr Bennett, a retired reconnaissance officer, to then-Secretary of the Smithsonian Robert Adams. Bennett wrote: "We need to focus all available energy and funds on a positive, upbeat

plan to proudly display the *Enola Gay* to Americans as well as Japanese (after all, it also saved untold thousands of their lives and the almost certain total destruction of their country)."

Although Bennett and the "upbeat" lobby had been active for years, NASM had rejected their approach. Some of the Museum's advisors even thought it would be a mistake to display the bomber at all: Admiral Noel Gaylet, a member of NASM's research advisory council, a naval aviation officer during the war, and later chief of Pacific forces, felt that any exhibit of the *Enola Gay* would be seen as "glorifying" or "taking pride" in the bombing. But Harwit wanted to display the airplane, and he planned to offset any triumphalism with images of Japan's suffering, along with a discussion of attempts to prevent the use of nuclear weapons. The exhibit, he believed, would be "thought provoking and inspiring."

But as this plan became known, Harwit and his staff came under attack from a wider group of critics. The debate over how upbeat or bleak the exhibit should be—and what the exhibit labels should say—went on in private meetings from 1992 to 1994. Then came the public assault.

Harwit and the exhibit's curators shared a draft of the exhibit script with advisors in February 1994. Air Force historians Richard Hallion (an *Air & Space* contributing editor) and Herman Wolk submitted critical comments but

## Briefly Noted

### PICTURING SPACE

**Reaching for the Stars** by Peter Bond. Cassell, 1996. 128 pp., photos, paintings, diagrams. \$27.95 (hardcover). A merging of U.S. and Soviet space history with images and original art from both programs in a large-format art book.

### TWO AND A HALF POUNDS OF FACTS!

**AIM/FAR 1997** edited by Charles F. Spence. McGraw-Hill, 1997. 715 pp. \$13.95; includes free mid-year update (paperback). All the contents of the *Aeronautical Information Manual* and the Federal Aviation Regulations in one fat volume. Impress your friends, but don't drop it on your foot.

### OLD AIRPORTS

**Forgotten Fields of America** by Lou Thole. Pictorial Histories, 1996. 157 pp., b&w photos. \$14.95 (paperback). Period photos and reminiscences of World War II training bases, then and now.

**Airfields in the Second World War** by G. Smith and P. Otter. Countryside Books (from U.S.: fax 011 44 1635 551004), 1995. 288 pp., each, b&w photos, \$27.95

(paperback). Four volumes cover Essex, Norfolk, Suffolk, and Lincolnshire, each in painstaking detail.

### JUST WHAT THE TITLE SAYS

**Jet Age Flight Helmets** by Alan R. Wise and Michael S. Breuninger. Schiffer, 1996. 245 pp., color photos. \$75.00 (hardcover). So many helmets, so little time. Includes some spaceflight examples. Will remind you of a yearbook.

**MiG Pilot: Russian Aircrew Survival Equipment and Instruction** by Alan R. Wise. Schiffer, 1996. 94 pp., color photos. \$19.95 (paperback). If you parachute into Siberia, bring this book—and all the stuff in it—with you.

### MODERN AIR WARFARE

**Top Guns** by Hugh McManners. Network (Zenith) 1996. 224 pp., color photos. \$29.95 (hardcover). From a BBC documentary, life with the Royal Air Force 29 Squadron and their Tornados.

**Air War Bosnia** by Tim Ripley. Motorbooks, 1996. 112 pp., color photos. \$21.95 (paperback). Picture book with extensive captions, covering mostly ground operations at air bases.



noted that only "a bit of tweaking" was needed to make the exhibit acceptable. Things went downhill from there.

By summer of 1994, NASM was taking heavy flak. The Air Force history office charged that NASM's script made the Americans out to be the aggressors in the Pacific, and wrote that the Air Force could not "in any way endorse" the text. The *Washington Post* ran a feature story and a negative editorial, saying that "political opinions are embedded in the exhibit." Peter Blute, a Republican Congressman from Massachusetts, collected signatures from 23 colleagues for a letter condemning the project. Harwit then invited the American Legion into the discussion and soon found himself negotiating all kinds of compromises. By the fall of 1994, he was haggling over specific phrases in the script—for example, changing a reference to Japanese soldiers on Okinawa from "defenders" to "troops."

Harwit says that after the Republicans gained a majority in Congress in November 1994, the American Legion stopped cooperating. When Harwit proposed a change to the exhibit based on new scholarship that sharply reduced the estimate of how many American lives were spared by avoiding an invasion of Japan, the Legion demanded that the exhibit be canceled. Powerful members of Congress echoed the demand, insisting also that Harwit be dismissed and threatening to zero out the Smithsonian's budget. In January 1995, just four months into the job, Smithsonian Secretary Michael Heyman terminated the exhibit and launched a revised version. In April, before Smithsonian officials were to testify in Senate hearings on the case, Heyman asked for Harwit's resignation.

The book ends with a series of stinging indictments. Harwit charges that Heyman ordered him and other NASM staffers to communicate only verbally with Japanese officials to avoid creating "a paper trail." He claims that Heyman blocked him from presenting his story at an academic meeting on "Museums in a Democratic Society" held at the University of Michigan in April 1995. Finally, Harwit writes that Heyman bowed to a Congressional demand that the exhibit's text and catalog, set for publication, be "withdrawn and suppressed."

For all its intensity and breadth, the book lacks something. Harwit doesn't provide a critical analysis of mistakes that he himself may have made. He does concede that the first draft of the *Enola Gay* script had "certain weaknesses," and he admits that he overestimated the

public's knowledge about World War II. But that's about as far as his introspection goes. We may have to wait for responses from the other participants in this affair to get a complete picture of what went wrong.

—*Eliot Marshall is a senior writer for Science magazine.*

**My Two Wars** by Moritz Thomsen. Steerforth Press, 1996. 317 pp. \$25.00 (hardcover).

Moritz Thomsen, one of the finest undiscovered American authors of this century, was shaped by two battles. The first was a running psychological war he fought with his father, Charles Thomsen, a business tycoon and emotional tyrant given to torturing family pets, beating up romantic rivals, and belittling, even defrauding, his own children. In this bleak but arresting memoir, Thomsen casts himself as "a rather unimportant extension of my father, a little something that belonged to him."

Thomsen's second war, World War II, was an even more harrowing test of character. In an early taste of battle over Germany, the 28-year-old Thomsen—a squadron bombardier with the 91st Heavy Bombardment Group—mistakes the evasive maneuvers of another B-17 as the "puppyish antics" of some hotshot pilot "entertaining his crew with adolescent foolishness." Not until the wings of the diving airplane break off and its fuselage snaps in half does Thomsen grasp the horrific magnitude of the spectacle unfolding before his eyes: "A half dozen bodies with unopened chutes spill out and down, falling with incredible slowness. Their last gift will be that interminable minute as they fall, a whole minute to make some final peace. It is more than some of us will get."

What the reader gets in *My Two Wars* is a sloppy, sprawling, rollicking ride of a book, devoid of heroes and moral absolutes but full of the fear, pain, rage, exhilaration, and guilt felt by men who survive combat.

In its comedic moments—as when Thomsen portrays his accidental bombing of a German cabbage patch as a "death blow to the sauerkraut industry"—the book equals the best of Joseph Heller. More often, however, *My Two Wars* evokes the banal horrors of Joseph Conrad. Newly arrived in England, for example, Thomsen glances out the window of the officers' lounge to see an American bomber "sliding very fast down the runway, its undercarriage hidden in sparks." Crewmen jump from the waist door before the airplane explodes in a boiling pillar of black smoke, yet the others in the room—combat veterans

all—hardly give it a thought: "A couple of the pool players closest to the window now turned and gazed for a moment with expressionless faces toward the smoke; then they returned to the game."

Thomsen never conquered his twin demons, yet the honesty with which he confronts them yields a tale of great intimacy and power. After completing the 27 missions required of lead crews, Thomsen returned to California to try his hand at farming. Then, renouncing his father's millions, he joined the Peace Corps at the age of 48 and emigrated to Ecuador, where he died in 1991, a few days after finishing *My Two Wars*.

—*Allan Fallow is an editor at Time-Life Books in Alexandria, Virginia.*

**Egypt: Antiquities From Above** by Marilyn Bridges with an essay by Penelope Lively. Bulfinch/Little Brown, 1996. 128 pp., b&w photos. \$40.00 (hardcover).

Although the title of Marilyn Bridges' book implies that its focus is on Egypt's monuments, the reader will come away



with quite a different impression. For in every one of these black-and-white aerial photos, it is the desert itself, in all its gritty, desolate,

inhospitable splendor, that is the most memorable subject. From Bridges' vantage point, the permanence and immutability of the natural landscape are magnified.

One image in which the bleakness of the landscape is brought front and center shows the sixth century monastery of St. Simeon, outside Aswan. Last spring I rode a camel to the monastery, and as the beast lurched down a gigantic sand dune, hell-bent on getting me to the ruins in record time, I saw the monastery at eye level, rising up from the desert floor, majestic and serene, a fortress built to ward off the encroaching desert. Bridges' view offers quite a different perspective. As photographed from above, the ruins of St. Simeon look tiny and fragile, like some ancient island in a sea of dunes.

Bridges' photos of the most crowded tourist sites—the Valley of the Kings necropolis, the temple of Ramses II at Abu Simbel—overlook the untidiness of the real world. Tourists are mere specks, and the landscape's incredible heat and choking dust are nowhere in evidence.

Because private aviation in Egypt is almost nonexistent, Bridges had to cajole her way onto whatever aircraft was



# NEW from AIR & SPACE

Smithsonian



## Runways of Fire

When the feature "Runways of Fire" first appeared in our October/November 1995 edition, this video version of the story debuted with it. The saga of the Cold War zero-length launch experiments, in which fully loaded jet fighters flew from flatbed trailers, is unmatched in aviation history. Order this all-new video direct from Air & Space/Smithsonian Magazine. Item No. ROFO3, \$19.95 (includes shipping and handling)

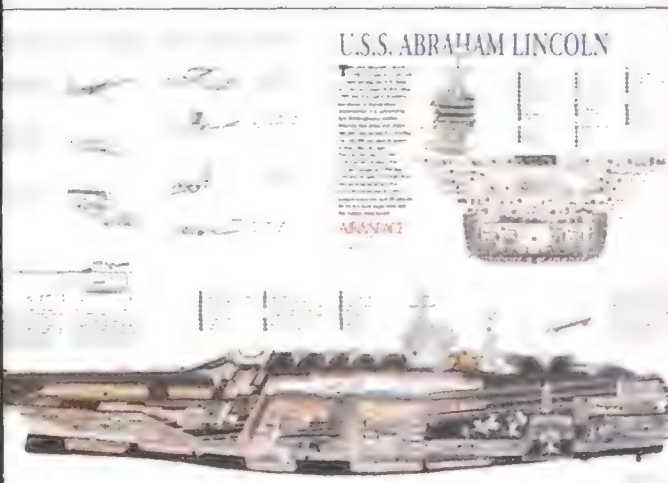
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available, from a Cessna 172 to an old Russian military helicopter. She even persuaded a general to let her ride along (illegally, of course) on an Egyptian Air Force training flight over Giza, where she was able to photograph the pyramids and the Great Sphinx.

The photos compiled from her trips to Egypt are enriched by a foreword by Penelope Lively, who grew up a few miles outside Cairo. Lively's first-hand knowledge of the people and the land helps place modern Egypt in perspective and provides a point of departure from which we can view its past.

—Rita Cipalla is a Seattle freelance writer specializing in aerospace.

**The Alaska-Siberia Connection: The World War II Air Route** by Otis Hays Jr. Texas A&M University Press, 1996. 179 pp., photos and maps. \$34.95 (hardcover).

In March 1941, the Lend-Lease Act was signed into law by President Franklin Roosevelt. Intended to share U.S. arms production and supplies with Great Britain and other nations threatened by would-be conquerors, the act eventually benefited 32 nations. Just four months after signing the bill, Roosevelt and the world watched Germany stage a massive invasion of the Soviet Union. The Red Army withdrew across huge areas of the motherland as it desperately tried to slow and hold the invaders.

The U.S. War Department quickly decided to include the Soviet Union in the Lend-Lease program, and plans were laid to transport war materiel to the beleaguered ally. In this book, Otis Hays Jr. presents the history of the Northwest supply route between the Soviet Union and the United States. According to the author, over 56 percent of all the aircraft delivered to the Soviet Union under the Lend-Lease Act were ferried across the Bering Strait, primarily P-39 Airacobras and P-63 Kingcobras, A-20s, and B-25s.

Geographic, technical, and cultural differences conspired to undermine the working relationship required to pull off the complex task of supplying almost 8,000 aircraft to the Soviets. Hays relates how the people involved in the Northwest supply route coped with these factors.

Regrettably, while the author relates the who, what, when, and where of this little-known aspect of the war, he has virtually ignored the personalities of the people involved and the drama of the underrated but immensely important ferry work. His retelling of the stories of crash



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landings, defections, espionage, and even accusations of murder is poorly done, and he supplies almost no information about the aircraft involved. There are lots of other facts and figures, but in a book that focuses on

transferring aircraft, more aviation-related information would have been helpful.

—Mark W. McKellar is a writer who concentrates on aviation and naval history.

**Stalin's Aviation Gulag: A Memoir of Andrei Tupolev and the Purge Era** by L.L. Kerber; edited by Von Hardesty. Smithsonian Institution Press, 1996. 394 pp., b&w photos, \$45 (hardcover).

In October 1937, with Joseph Stalin's purges at their height, agents of the Soviet dictator's secret police arrested Andrei Tupolev, who was one of the top aircraft designers in the Soviet Union. His bombers had flown in the Spanish Civil War but had performed poorly against late-model German fighters. An ambitious rival, A.S. Yakovlev, then

denounced him to Stalin, who ordered his imprisonment.

But he did not die amid nameless millions. Instead, he received orders to set up a sharaga, a center for aircraft design staffed by fellow prisoners. These included Vladimir Petlyakov, a leading designer of fighters, and Sergei Korolev, who would rise to direct the country's post-war missile and space programs.

This book, written by a longtime and close associate of Tupolev who shared his imprisonment, describes this world in great detail. The book originated as a samizdat, a typescript circulated among Soviet dissidents and copied by hand. It is largely an account of Tupolev's life and work, and of the aircraft he designed during a career that spanned a half-century. But it also gives a close look at life in the sharaga.

These inmates set to work within Moscow's Central Aero-Hydrodynamic Institute, where they had a full array of equipment and facilities. They also received good food. But they couldn't go home at night; they slept in barracks. They received no pay, working as slaves. The men worried ceaselessly about their wives and children, who often had to move into the small apartments of charitable relatives.

The men worked in an atmosphere of paranoia, where minor engineering difficulties were treated as sabotage. Colleagues sometimes disappeared suddenly, sent to concentration camps in Siberia. Visits with wives and children were rare, brief, and closely monitored. If a woman started to talk about her hardships, a guard would interrupt: "It is forbidden to speak of this!"

The men found relief by escaping into their work. Within the sharaga, they created a fine twin-engine attack bomber, the Tu-2. It won Tupolev and others a release from their sentences. He went on to become Moscow's leading designer of long-range aircraft, building both strategic bombers and airliners—including the supersonic Tu-144.

The book's organization is choppy in places, shifting suddenly from discussion of imprisonment to details of aeronautics. And it contains occasional boilerplate, such as "the selfless labor of the workers." But as a classic of samizdat literature, and as a personal account of Stalin's Great Terror, this book deserves to be read.

—T.A. Heppenheimer wrote about the Navaho and Atlas missiles in the Dec. 1996/Jan. 1997 issue.

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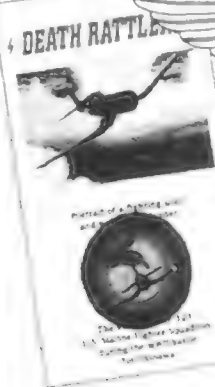


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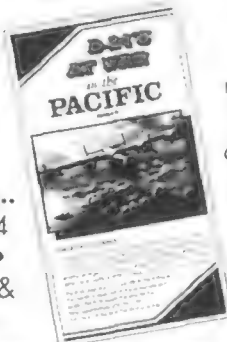


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## CALENDAR

### February 10-March 1

Airshow Down Under. Take a tour of aviation museums in New Zealand and Australia, and see the sights at the largest airshow in the southern hemisphere. For more information, contact Ray Thomas in Illinois at (217) 877-9632.

### February 16

Open Cockpit Sunday. A dozen aircraft open for inspection, including World War II and modern fighters, helicopters, and a DC-3 airliner. New England Air Museum, Bradley International Airport, Windsor Locks, CT, (860) 623-3305.

### February 23 & 24

Reunion of the 392nd Bomb Group, 2nd Air Division, 8th Air Force, which was stationed in Wendling, England, during World War II. Orlando, FL. For more information, contact Teddy Egan at (407) 644-5439.

### March 1

"Flying Fortress Revisited": B-17 exhibit opening and seminar. *Thunderbird*, a B-17 bomber that flew more than 100 missions during World War II, is featured in a special exhibit that examines the profound impact that Flying Fortresses had on world events. Colonel Robert L. Morgan, captain of the B-17 *Memphis Belle*, will give a lecture at 2 p.m. in the briefing room. Lone Star Flight Museum, Galveston Island, TX, (409) 740-7722.

### March 8 & 9

Rocky Mountain Air Fair. Aviation career seminars and more than 100 aviation-related exhibits, including a B-1A Lancer bomber. Wings Over the Rockies Aviation and Space Museum, Denver, CO. For more information, contact Marilyn Taylor at (303) 659-7265.

### March 13-15

Women in Aviation Conference. Sponsored by Women in Aviation International. Hyatt Regency-Dallas Fort Worth, Dallas, TX. For more information, contact Peggy Baty at (513) 839-4647.

### March 16

Open Cockpit Sunday. A dozen aircraft open for inspection, including World War II and modern fighters, helicopters, and a DC-3 airliner. New England Air Museum, Bradley International Airport, Windsor Locks, CT, (860) 623-3305.

### March 17-21

28th Annual Lunar and Planetary Science Conference. This year's meeting will focus on new results in planetary science



from researchers in petrology, geochemistry, geophysics, geology, and astronomy. NASA Johnson Space Center, Houston, TX, (713) 486-2158.

### March 20

Vernal equinox occurs at 8:55 a.m. EST, marking the beginning of spring in the northern hemisphere.\*

### April 21-27

Reunion of the "Mosquitos," the 6147th Tactical Control Group, which was deployed during the Korean war. Tropicana Hotel, Las Vegas, NV. For more information, contact Commander James F. Kelly at (702) 796-5554.

### April 26

Santa Ana Army Air Base Wing 22nd Annual Reunion and Luncheon. Orange Coast College, Costa Mesa, CA, (714) 631-5918.

### April 26 & 27

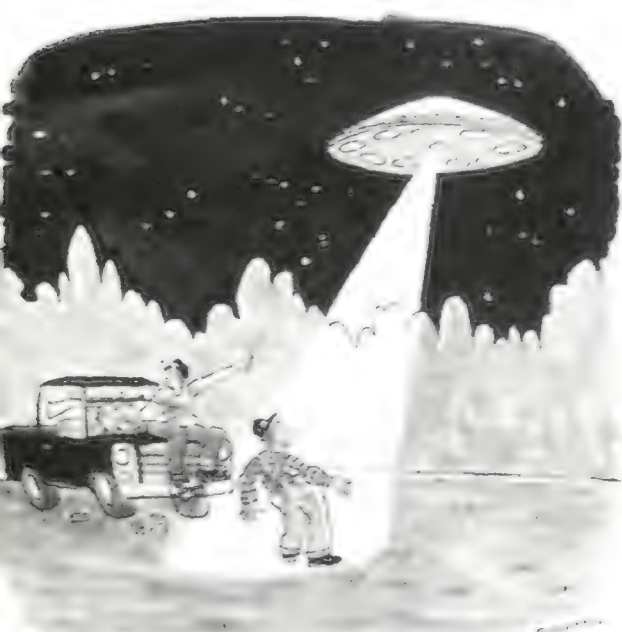
13th Annual Kitefest. Kite-making workshop and kite-flying contests. River Oaks County Park, Kalamazoo County, MI, (616) 383-8778.

### April 30-May 4

Reunion of the 89th Attack Squadron and members of the 8th and 90th Squadrons of World War II. Holiday Inn City Line, Philadelphia, PA. For more information, contact Cass Simon at (610) 566-5394.

*\*Call the Smithsonian Skywatcher's Report at (202) 357-2000 for recorded information on astronomical events.*

*Organizations wishing to have events published in Calendar should submit them four months in advance to Calendar, Air & Space/Smithsonian, 901 D St. SW, 10th Floor, Washington DC 20024. Events will be listed as space allows.*



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**August/September 1988.** Reef encounter, Piaggio, NASA photos, supernova, Bellanca.

**December 1988/January 1989.** X-1 engine, mini-space station, Galileo, soaring.

**February/March 1989.** B-52, Scout rocket, baggage handling, space art.

**June/July 1989.** Special Apollo issue! "Apollo 11" poster, Saturn V, how we got to the moon.

**August/September 1989.** The C-5, LDEF, Pan Am's Pacific, Kansas space museum.

**October/November 1989.** Mars propulsion, WWII's black pilots, spacesuits, Burnelli.

**December 1989/January 1990.** Autogiro, Voyager 2, Antarctica, Robert McCall.

**February/March 1990.** The Zero, Salyut 7, Magellan, around the world with a camera.

**June/July 1990.** Battle of Britain I, life in Star City, satellite sleuths, solar-power satellites.

**August/September 1990.** Target drones, Battle of Britain II, comet mission, Soviet missiles.

**December 1990/January 1991.** Sound barrier, Cosmodrome, X-rays, collision avoidance.

**February/March 1991.** Blimp, life on Mars?, rivets, electronic warfare.

**April/May 1991.** Shuttle poster, ultralights in Egypt, X-31, lifting bodies, kamikazes.

**June/July 1991.** Mars rovers, Jimmie Angel, P-51, beyond the shuttle.

**October/November 1991.** World War I fighters, asteroids, F-86 pilot, airmail.

**December 1991/January 1992.** Moonbase, spysats, cocaine wars, Biosphere 2, models.

**February/March 1992.** Pararescue, Admiral Yamamoto, nuclear rockets, Skylab.

**April/May 1992.** Reno races, speed poster, Big Bang theory, satellite rescue, the Shack.

**June/July 1992.** Space camp, GPS, hot jets, lovely losers, German boatplanes.

**August/September 1992.** Blue Angels, extraterrestrials, Earhart, Deep Space Network, Willow Run.

**October/November 1992.** Russian skydiving, importing the jet, tabloid tales, SETI, NASA on TV, Grand Canyon, planet hunters.

**February/March 1993.** Spruce Goose, V-2, terrorism, Russian space, dark matter.

**April/May 1993.** Airshows, probes poster, Star Trek, flight attendants, sun's edge.

**June/July 1993.** Test pilots, underwater warplanes, NASA's big tank, Jane's, gamma rays.

**August/September 1993.** NASA's ER-2s, Big Guns, black holes, banners, orbital rendezvous.

**October/November 1993.** Martin Mars, X-planes poster, astronaut training, new airlines.

**December 1993/January 1994.** Space militarization, escape from Cuba, combat comics, Soviet women pilots, weather satellites.

**February/March 1994.** Aggressors, DC-X, Apollo quarantine, ballooning, Airbus.

**April/May 1994.** Skunk works and poster, Apollo 8, Boeing 777, Echo.

**June/July 1994.** D-Day Marauders, Kunsan AFB, Apollo 11, solar sails, Wright airplanes.

**August/September 1994.** IMAX films, ferrets, movie flights, Russian airlines, software.

**October/November 1994.** Stearmans, ozone forecast, Russian arms, vintage lunar voyage, life in a SAC missile control center.

**December/January 1995.** Fly your dream, Pulkovo observatory, astronaut carry-ons, airline industry, P-3 Orions.

**February/March 1995.** Golden age, microgravity on Earth, Rwanda, X-plane hunters, Mir, Norden bombsight.

**April/May 1995.** Aircraft carrier and poster, Dan Goldin, military spending, mosquito sprayers, Alaskan aviation.

**June/July 1995.** B-52s destroyed, Milky Way, laminar flow, Apollo 13, MiGs in the Luftwaffe, Christen Eagles.

**August/September 1995.** Pacific war album, Martian meteorites, Munich airport, Minute-man missiles, skydiving.

For a searchable index of back issues, refer to [http://www.airspacemag.com/ASM\\_IndexTOC.html](http://www.airspacemag.com/ASM_IndexTOC.html)

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**The China Lake Launches.** Joel Powell, a space enthusiast since the Apollo flights, has been making yearly pilgrimages to the Kennedy Space Center and writing about obscure civilian and military space projects since the early 1980s. He lives in Calgary, Alberta.

**Flight for the Common Man.** Tom Harpole is a frequent contributor to *Air & Space/Smithsonian*.

**Gary and the Pirates.** Freelance writer Carl Hoffman lives in Washington, D.C., where, unfortunately, he hasn't found any abandoned warbirds to fund his retirement. He's still looking, though.

Scott Highton has been photographing aircraft for close to 20 years. He is well known for his virtual-reality and multimedia photography, particularly in difficult and remote locations, including underwater, aerial, and extreme environments. To see more of his work, visit [www.highton.com](http://www.highton.com) on the World Wide Web.

The underwater photograph that appears on page 31 was taken by Ed Robinson.

**H.M.S. Moon Rocket.** Tony Reichhardt is a contributing editor to *Air & Space*. One of his favorite movies when he was a kid was the 1964 adaptation of H.G. Wells' *First Men in the Moon*, in which Victorian-era British astronauts beat NASA to the first lunar landing.

**Portraits by Mayfield.** John Fleischman lives in Cincinnati and writes for such magazines as *Smithsonian*, *Discover*, and *The Atlantic*. The only aerial shots he takes are through jetliner windows. He usually forgets to turn off the flash.

**Last of the Mohawks.** John Sotham recently joined *Air & Space* as an

associate editor. He builds model airplanes and collects aviation books and memorabilia, much to his wife's delight.

Living vicariously through his photographs, Erik Hildebrandt has been able to experience some of the best moments in military aviation without enlisting.

**Company Town.** Former editor of *Flying* and *Professional Pilot* magazines, William Garvey has volunteered to file first-person reports on the next world circumnavigation by zeppelin.

Photographer Chris Sorensen has been published in more than 100 aviation publications worldwide.

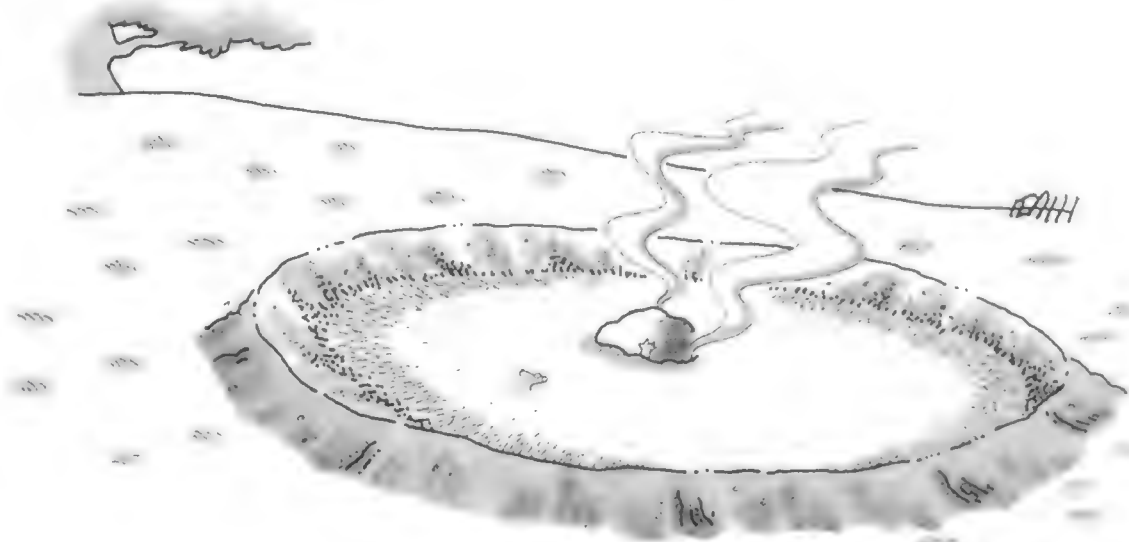
**The Nine Lives of Slick Six.** Bruce D. Berkowitz wrote about NASA's X-33 reusable launch vehicle in the Oct./Nov. 1996 issue.

Paul DiMare, who has a fascination with anything that flies, has had his paintings exhibited at the Virginia Air and Space Center in Hampton, Virginia, and published in *Smithsonian*, *Popular Mechanics*, and National Geographic books.

**One Good Year.** Tom Huntington was until recently the managing editor of *Air & Space*. He is now editor of *Historic Traveler* magazine and lives in Camp Hill, Pennsylvania.

Further reading: *The Boeing 247: The First Modern Airliner*, F. Robert van der Linden, University of Washington Press, 1991.

**Seven of a Kind.** Stan Solomon says that as he grows older, he is increasingly appreciative of objects like the Staggerwing, which, despite their advanced age, retain both their looks and their agility.



On the bright side, Luther could now distinguish meteors from meteorites.



# JOIN THE PIRATES

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SCOTT HIGHTON

## MEET ADMIRAL DON ENGEN

**B**eing named director of the National Air and Space Museum is only the most recent achievement in Admiral Engen's aviation career. The museum's new director talks with Associate Editor Diane Tedeschi about his past adventures and his future plans for the new exhibition building to be constructed at Dulles International Airport. ([www.airspacemag.com/TWD/TWD0003.html](http://www.airspacemag.com/TWD/TWD0003.html)).



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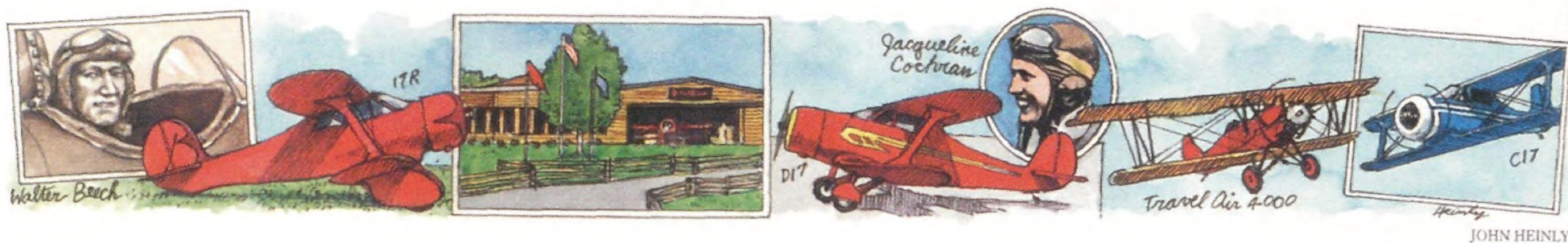
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## Seven of a Kind

**T**hree flags snap in the breeze outside the Staggerwing Museum in Tullahoma, Tennessee, 60 miles southeast of Nashville. Flanking the Stars and Stripes are the flags of Tennessee and—Kansas?

Located in the home of country music and sippin' whiskey, this museum not only flies the flag of a more northerly state, it also features a bit of Kansas soil. A plot near the front door contains prairie sod from the Beech Aircraft Corporation's original grass strip in Wichita. Clearly, this museum is seriously committed to documenting that company's early years.

Beech Aircraft was launched in 1932 by Tennessee native Walter H. Beech, who had previously teamed up with Clyde Cessna and Lloyd Stearman to form the Travel Air Company. After Beech broke away, the first product his company made was an elegant biplane whose wings had a distinctive stagger—the upper wing was set farther back than the bottom one. Designated Model 17, it was soon better known as the Staggerwing.

The airplane enjoyed a reputation for superb engineering, luxurious accommodations, and impressive speed. In 1936, Louise Thaden and Blanche Noyes, flying a model C17R, became the first female pilots to win the Bendix Trophy race. The next year, Jacqueline Cochran set a woman's world speed record of 203.9 mph in a 600-horsepower model D17W.

In addition to speed, Staggerwings were famed for stylishness. With its sharply sloped windscreen and flaring I-struts, the Ted Wells design epitomized the era of streamlining and Art Deco. The aircraft became a status symbol, and movie stars posed next to them for publicity photos.

Beech made almost 800 Staggerwings before ending production in 1946. Today, about 225 remain. The Staggerwing Museum has seven, representing every model Beech made.

The first one that visitors encounter is the prototype, serial number 1, which sits just inside the main entrance of the

Walter H. Beech Hangar. The red and maroon airplane first flew in November 1932, just seven months after Beech Aircraft was launched. Three years later, a weather-related crash near Kingston, New York, totalled the airplane and killed Blanche Noyes' husband, Dewey Noyes, a famed pilot in his own right. After almost 30 years, Staggerwing enthusiast Steve Pfister found the airplane in upstate New York and spent eight years working to restore it. After Pfister died, museum member Jim Younkin completed the restoration.

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*Staggerwing Museum, P.O. Box 550, Tullahoma, TN 37388. Phone (615) 455-3594. Open weekends Mar.–Nov., 1–4 p.m.; other times by appointment. Admission \$4 (visits by appointment: \$5).*

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Inside the hangar, five more Staggerwings sit nose-high, looking as if they had just rolled out of the Beech assembly plant and were awaiting buyers in a showroom. They range from a 1935 cream and red B model, the first with fully retractable gear, to the design's final iteration, the G, which had a more streamlined windshield and cowl.

The hangar also houses two aircraft representing Walter Beech's years at Travel Air: a 1929 open-cockpit Travel Air 4000 biplane and a monoplane nicknamed the Mystery Ship, which won the 1929 Thompson Cup in Cleveland.

With its paneled walls and carpeted floors, the Walter H. Beech Hangar is really no hangar at all. It's been outfitted with such homey touches as rocking chairs, plants, and old photos—one faded sepia print shows Charles Lindbergh and Walter Beech with a Travel Air 2000.

Since it was founded in 1973, the museum has added four other buildings. One, a log cabin informally called the lounge, displays old-fashioned spokeshaves, cable splicers, and other tools to represent the craftsmanship that went into each Staggerwing. Display

cases feature newspaper stories documenting Staggerwing exploits, and a videotape tells the aircraft's story.

The lounge is connected to the Louise Thaden library, which displays such Thaden memorabilia as the flier's Bendix Trophy and her pilot's license, signed by Orville Wright.

There's also an Olive Ann Beech Gallery and Chapel, named after Walter Beech's wife, who ran the company for almost 40 years after her husband died. Finally, visitors can check out the restoration center, which houses the collection's seventh Staggerwing—the “Naked Beech,” an E model that has been stripped of its fabric to make the complex wood and metal skeleton visible.

The museum's growth has been funded primarily by its members; it receives no financial support from Beech Aircraft or any other aircraft company. Each October the members converge on the museum for a convention, where they can share their enthusiasm. Corporate heads and dirt farmers attend seminars while their Staggerwings sit wingtip to wingtip in neat lines outside, evoking an image of the Wichita factory's flightline in the 1930s.

Also parked at the conventions are examples of the Staggerwing's successor: the Model 18 Twin Beech. The museum's membership includes a contingent of Model 18 fans, and their devotion has inspired the museum board to propose adding a Twin Beech Extension—a building that would house examples of the twin-engine classics, which enjoyed a production run of 25 years.

“With this next step we're taking the history of [Walter] Beech from the 1920s up to about 1970,” says museum president John Parish. And what about the rest of the Beechcraft line? “I suspect that someday there'll be a desire to include other aircraft of the Beech heritage,” he says, “but right now most feel that we should grow carefully and grow slowly. However, you can't stop growing. That's the natural way.”

—Stan Solomon



*I* FIND THE GREAT THING IN THIS WORLD  
IS NOT SO MUCH WHERE WE STAND, AS IN WHAT DIRECTION WE ARE MOVING. -Oliver Wendell Holmes, Jr.



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**“If you want to grow old as a pilot, you’ve got to know when to push it, and when to back off.”** *Chuck Yeager*

At 21, only three years after first boarding a plane, Chuck Yeager was leading a squadron of fighter pilots in World War II. And at the age of 24, he became the first person to fly faster than the speed of sound.

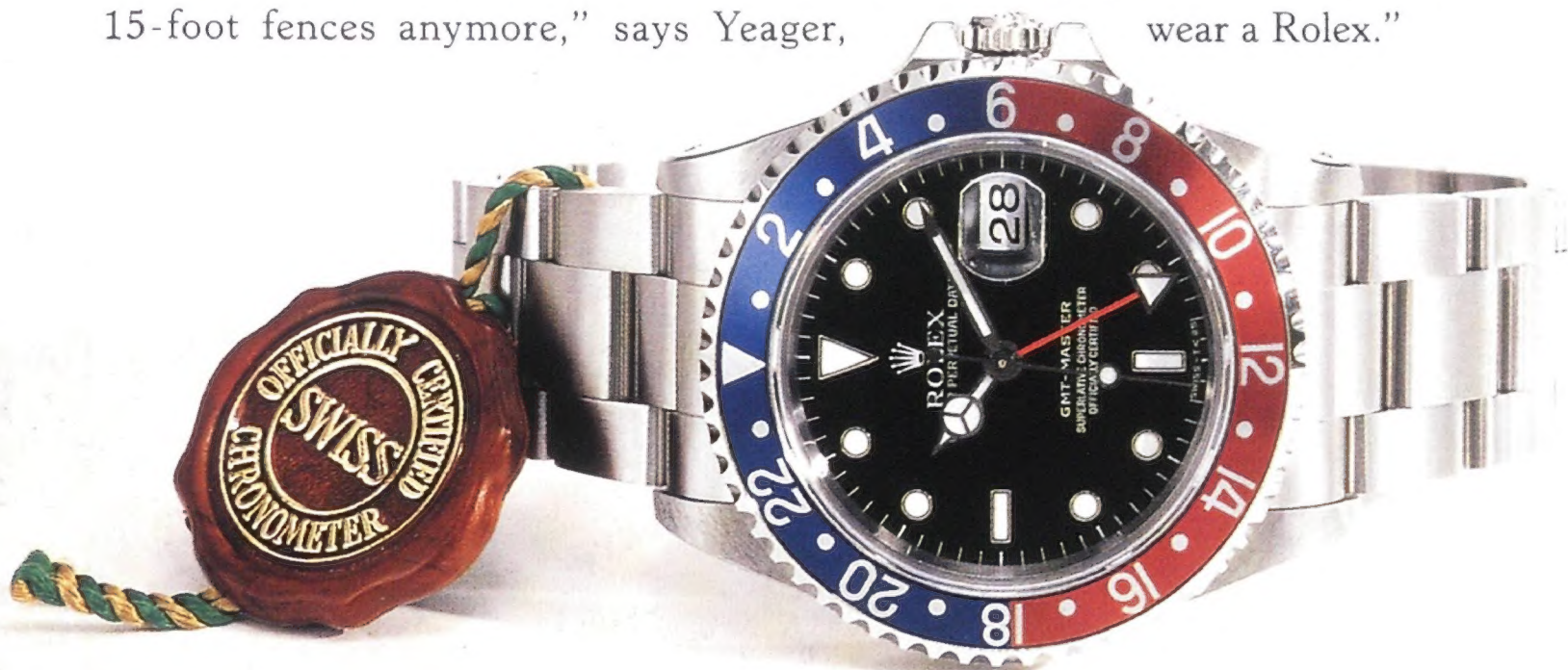
Yeager remains a man on the move. He’s an avid sportsman and a consulting test pilot who still loves to fly. “Maybe I don’t jump off 15-foot fences anymore,” says Yeager,


“but I can still pull 8 or 9 G’s in a high-performance aircraft.” And in all his exploits, Yeager depends on a rugged and reliable timepiece. “I wore a Rolex more than 40 years ago when I broke the sound barrier and I still do today,” says Yeager matter-of-factly.

“A pilot has to believe in his equipment. That’s why I wear a Rolex.”



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